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FOOD

AND ITS

ADULTERATIONS.

LONDON:
A. and G. A. SPOTTISWOODE,
New-street-Square.

FOOD

AND ITS

DULTERATIONS;

COMPRISING THE REPORTS OF THE

NALYTICAL SANITARY COMMISSION OF
"THE LANCET"

FOR THE YEARS 1851 TO 1854 INCLUSIVE,

REVISED AND EXTENDED:

BEING RECORDS OF THE RESULTS OF SOME THOUSANDS OF
GINAL MICROSCOPICAL AND CHEMICAL ANALYSES OF THE SOLIDS AND
FLUIDS CONSUMED BY ALL CLASSES OF THE PUBLIC;

AND CONTAINING

HE NAMES AND ADDRESSES OF THE VARIOUS MERCHANTS, MANUFACTURERS, AND
TRADESMEN OF WHOM THE ANALYSED ARTICLES WERE PURCHASED.

BY ARTHUR HILL HASSALL, M.D.,

CHIEF ANALYST OF THE COMMISSION:

TOR OF MEDICINE IN THE UNIVERSITY OF LONDON; LICENTIATE OF THE ROYAL COLLEGE
PHYSICIANS OF LONDON; FELLOW OF THE ROYAL MEDICAL AND CHIRURGICAL SOCIETY;
ELLOW OF THE MEDICAL SOCIETY OF LONDON; FELLOW OF THE LINNÆAN SOCIETY;
MEMBER OF THE COUNCIL OF THE BOTANICAL SOCIETY OF LONDON;
RRESPONDING FELLOW OF THE MEDICAL SOCIETY OF MUNICH AND OF THE NATURAL
HISTORY SOCIETIES OF MONTREAL AND DUBLIN;
LECTURER ON MEDICINE AT THE ROYAL FREE HOSPITAL MEDICAL COLLEGE;
PHYSICIAN TO THE ROYAL FREE HOSPITAL.

Illustrated by One hundred and fifty-nine Engravings,

SHOWING THE MINUTE STRUCTURES OF THE GREATER NUMBER OF THE
VEGETABLE SUBSTANCES EMPLOYED AS ARTICLES OF FOOD, ALSO THOSE OF THE
MAJORITY OF THE SUBSTANCES USED FOR ADULTERATION.

W.

LONDON:
LONGMAN, BROWN, GREEN, AND LONGMANS.
1855.

TX563
H358

Dedication.

TO

SIR BENJAMIN HALL, BART., M.P.,

PRESIDENT OF THE GENERAL BOARD OF HEALTH.

SIR,

The fact has at length become recognised that the sanitary condition of the people is the great social question of the day, for it is one which vitally affects the interests, the well-being, and even the safety of every individual throughout these realms, rich and poor, high and low, but especially the latter.

One statistical fact only need be cited to show its vast importance, not merely in this country, but throughout the whole world; this is, that more persons have died, and still continue to die, from the neglect of proper sanitary precautions, and from living in violation of the fundamental laws and rules of health, than have ever fallen in battle.

The causes which tend to impair health and to shorten life are numerous, and surround us daily. The majority of them may, however, be referred to certain heads,—as foul air, impure water, and adulterated food and drink. Amongst these causes, the last is assuredly not an unimportant one, as is abundantly demonstrated by the various facts recorded in the pages of this work, now dedicated to you.

From your position as Chief Minister of Health for this country, evidence is doubtless brought before you daily of the magnitude of the interests involved in the question of Sanitary Reform; of this I am aware you are fully sensible, and not only so, but that you are animated with the determination to exert to the utmost the powers entrusted to you, with a view to the improvement of the sanitary condition of the people, and, by improving this, to contribute to their well-being in a variety of ways.

Called to take the lead in the sanitary movement, at an important and critical period of its progress, you have already been the means of effecting much good; and doubtless, when sufficient time has elapsed for maturing your views, a still larger amount of benefit to the public will result.

The importance of Sanitary Reform is fully recognised by the people, who are quite prepared to support any measures that may be requisite for carrying it into effect; and I trust that Parliament will be found equally so when appealed to, as it will doubtless be, during the next session. It must have been apparent to all who had anything to do with carrying out sanitary measures during the epidemic which has just passed from amongst us, that the powers of the General Board of Health, as at present constituted, are wholly inadequate to deal successfully with an emergency of this kind; they are equally so even for ordinary exigencies connected with the Public Health.

I have been led to dedicate this work to you because, treating as it does of an important branch of Public Hygeine, it appeared to me that you, as the Head of Sanitary Reform in this country, were of all others the fittest person to whom it should be addressed; moreover, you have already announced your intention of dealing with the question of Adulteration.

I have the honour to remain,
With great respect,
Your Obedient Servant,
ARTHUR HILL HASSALL.

8. Bennett-street, St. James'-street,
Dec. 1854.

INTRODUCTION.

Sufficient will be found recorded in the pages of this work to show that the subject of the Adulteration of Articles of Food and Drink is one of extreme and even of national importance. Considered in relation to the various substances employed in Medicine, it assumes, if possible, a still higher and graver interest.

The magnitude and importance of this question have been, to some extent at least, already acknowledged, as shown by the publication, first of Accum's Treatise, and subsequently by the works of Mitchell, Normandy, Chevalier, and MM. Jules Garnier and Harel, as well as by the several enactments which have been passed from time to time and in different countries for the purpose of suppressing adulteration. Hitherto, however, the subject has never received that amount of attention which, for a variety of reasons, it so strongly demands. This has arisen partly from the fact that the extent of the evil has only recently been made fully known, and this chiefly through the investigations recorded in the present work. Now that the magnitude of the mischief has been demonstrated, and the methods by which the several adulterations practised may be discovered with ease and certainty pointed out, we may, it is to be hoped, expect that but a very short period will be permitted to elapse before the subject will be duly considered and discussed, with a view to some effective legislation.

The adulterations practised differ in kind as well as in degree. One form of adulteration consists in the addition of substances usually of greatly inferior value, for the sake of bulk and weight, the choice being determined by the cheapness of the substitute, and its fitness for the peculiar adulteration required. This is the principal and most frequent description of adulteration practised.

Another form of adulteration consists in the addition of colouring matters of various kinds, with a view to heighten the colour, and, as it is considered, to improve the appearance of the articles, as well as to conceal other forms of adulteration. This is a very prevalent adulteration, and it is the most objectionable and reprehensible of all, because substances are frequently employed, for the purpose of imparting colour, possessing highly deleterious and even in some cases poisonous properties, as various preparations of lead, copper, mercury, and arsenic. Of the use of these substances many instances are recorded in the pages of this work.

A third description of adulteration consists in the admixture of substances for the purpose of imparting smell, flavour, pungency, and other properties.

We will now enumerate the principal substances proved by actual observation and analysis to be employed for each of the three purposes above mentioned, viz., to add weight and bulk, to impart colour, and for the sake of smell, pungency, &c.

The substances employed for the purpose of adding *weight and bulk* to the different articles, Reports upon which are given in this work, are as follow:—In the case of

ARROW-ROOT	Sago, Potato, and Tapioca Starches, and various mixtures and combinations of these with the inferior Arrow-roots.
ANCHOVIES	Dutch, French, and Sicilian fish.
BREAD	Mashed Potatoes, Water.
BUTTER	Water.
CINNAMON	Cassia, and most of the articles mentioned under SPICES.
COFFEE	Chicory, roasted Wheat, Rye and Potato Flours, Burnt Beans, Acorns, Mangel-wurzel.
CHICORY	Roasted Wheat and Rye Flours, Burnt Beans, Acorns, Mangel-wurzel, Carrot, Sawdust, Mahogany Sawdust, Burnt Sugar.
COCOA AND CHOCOLATE	Maranta, East India, Tacca or Tahiti Arrow-roots; Tous les Mois; the Flours of Wheat, Indian Corn, Sago, Potato, and Tapioca, and various Mixtures of these; Sugar; Chicory.
COLOURED CONFECTIONERY.	Wheat and Potato Flours, East India Arrow-root, Hydrated Sulphate of Lime.
CAYENNE	Ground Rice, Mustard Husks, Deal Sawdust, Salt.
CUSTARD AND EGG POWDERS.	Wheat, Potato, and Rice Flour, and mixtures of these.
CURRY POWDER	Potato-Flour, Ground Rice.
GINGER	Wheat, Sago, and Potato Flours; Ground Rice; Mustard Husks.
GIN	Water, Sugar.
ISINGLASS	Gelatine.
LARD	Potato Flour, Water.
MILK	Water.
MUSTARD	Wheat Flour, Turmeric.
MARMALADE	Pulp of Apples or Turnip.
OATMEAL	Barley Flour, and the Integuments of Barley, called Rubble.
PORTER AND STOUT	Water.
PEPPER	Wheat and Pea Flours, Ground Rice, Ground Mustard Seeds, Linseed Meal, P. D. or Pepper Dust.
SPICES	Wheat, Sago, and Potato Flours; East India Arrow-root; Ground Rice; Mustard Husks; two Vegetable Substances, one like Linseed Meal, Powdered Clove Stalks.
SUGAR	Potato Flour, Tapioca Starch.
TEA	Exhausted Tea Leaves; Leaves other than those of Tea, foreign and native; amongst the latter those of Sycamore, Horse Chesnut, and Plum; Lie Tea; Paddy Husk.
TOBACCO	Water, Sugar, Treacle, and Salts.
VINEGAR	Water.

The principal articles used with the view of imparting *colour* and for concealing other adulterations are, in the case of

ANCHOVIES	Bole Armenian, Venetian red.
BOTTLED FRUITS AND VEGETABLES.	Certain Salts of Copper, usually the Acetate.
COFFEE	Burnt Sugar or Black Jack.
CHICORY	Ferruginous Earths, as Venetian Red and Reddle, and Bur Sugar or Black Jack.
COCOA	Venetian Red, Red Ochre, and other ferruginous earths.
CUSTARD POWDERS	Chromate of Lead or Chrome Yellow, Turmeric.
CAYENNE	Venetian Red, Oxide of Lead or Red Lead, Bisulphuret Mercury or Vermilion, Turmeric.
CURRY POWDER	Red Lead, Venetian Red.

ED CONFEC- ARY.	Cochineal, Lake, Red Lead, Vermilion, Indian Red ; Gamboge, Lemon, Orange and Deep Chrome Yellows ; Indigo, Ferrocyanide of Iron or Prussian Blue, Antwerp Blue, Artificial Ultramarine ; Carbonate of Copper or Verditer, Emerald Green or Arsenite of Copper ; the three Brunswick Greens, which consist of a mixture of Chrome Yellow and Prussian Blue in different proportions ; Brown ferruginous Earths, as Umber, Sienna, and Vandyke Brown ; Carbonate of Lead or White Lead.
	Turmeric Powder.
	Annatto.
ED	Turmeric Powder.
AND STOUT	Sugar and Treacle.
S	Salts of Copper, commonly the Acetate.
MEATS AND	Bole Armenian, Venetian Red.
VES	Salts of Copper, including the Acetate.
	Red Ferruginous Earths, as Bole Armenian, Venetian Red ; Treacle.
	Chromate and Bichromate of Potash, Chrome Yellow, Red Lead, Umber, Red and Yellow Ochre.
	Indigo, Prussian Blue, Turmeric, Chinese Yellow, Black Lead, China Clay or Kaolin, Soapstone or French Chalk.
CO	Sugar, Treacle.
AR	Burnt Sugar.

chief substances employed for the third purpose, viz., to impart *smell*, r, *pungency*, and *other properties*, are, in the case of

	Alum, Hards, and Stuff.
S	Salt.
	Alum.
R	Cayenne Pepper.
	Cayenne Pepper, Cassia or Cinnamon, Gin Flavourings of different kinds.
	Carbonate of Soda, Caustic Lime, Salt.
S	Salt.
	The Chromates of Potash, Carbonate of Ammonia, Lime, Silica or Powdered Glass, Salt, Orris-root.
	Catechu, Gum, Sulphate of Iron, Le Veno Beno, Chinese Botanical Powder.
CO	Sugar, Treacle.
AR	Sulphuric Acid.

above lists include, without exception, those substances only which and original analyses, as recorded in this work, have shown on the st evidence to be really employed. This list would have been trebled, those articles been enumerated which, according to the authority of observers, either have been or are employed for the purpose of ration. It was thought advisable, however, not to include these, e, in most cases, the authors of the works in question do not speak heir own observation or investigations, but have handed down and d various statements made on the authority of previous writers. In ay much error has crept into the subject, and thus it has happened orks treating of Adulteration abound in statements respecting the nces employed which are not verified on personal research. It be remembered, also, that the above lists refer only to those articles and drink of which Reports are given in this work, and do not any of the various preparations employed in Medicine: had these dded, the lists would have been much extended. The many imporcts connected with the adulteration of Drugs and Pharmaceutical

Preparations are reserved for another occasion. Further, there is no doubt but that more extended observation and investigation will show that many other substances, in addition to those contained in these lists, are sometimes employed.

The whole of the adulterations, to whichever of the three classes they belong, discovered by ourselves in the course of our investigations, are exhibited in the following table: —

Classified List of the various Substances ascertained by Ourselv to be employed for the different Purposes of Adulteration: viz. for Bulk and Weight, for Colour, and for Smell, Taste, and othe Properties.

	For Bulk and Weight.	For Colour.	For Taste, Smell, and other Properties.
Arrow-Root	Sago, Potato, and Tapioca Starches, and various mixtures and combinations of these with the inferior arrow-roots.		
Anchovies	Dutch, French, and Sicilian Fish.	Bole Armenian, Venetian Red.	
Bread	Mashed Potatoes	- - - -	Alum, Hards and Stuff.
Butter	Water.		
Bottled Fruits and Vegetables.	- - - - -	Certain Salts of Copper, usually the Acetate.	Salt.
Cinnamon	Cassia, and most of the articles mentioned under Spices.		
Coloured Confectionery.	East India Arrow-root, Wheat and Potato Flour, Hydrated Sulphate of Lime.	Cochineal, Lake, Indigo, Prussian Blue, Antwerp Blue, Artificial Ultramarine, Carbonate of Copper or Verditer, Carbonate of Lead or White Lead, Red Lead, Vermilion; Chrome Yellow or Chromates of Lead, Lemon, Orange, and deep; Gamboge; the three Brunswick Greens, Emerald Green or Arsenite of Copper, Indian Red; brown ferruginous earths, chiefly Umber, Sienna, and Vandyke Brown, and various combinations of the above pigments.	
Coffee	Chicory, Roasted Wheat, Rye and Potato Flours, Roasted Beans, Mangel-wurzel, Acorns.	Burnt Sugar, or Black Jack.	
Chicory	Roasted Wheat and Rye Flours, Burnt Beans and Acorns, Burnt Sugar, Sawdust, Mahogany Sawdust, Carrot, Mangel-wurzel.	Ferruginous earths, as Venetian Red and Umber, Burnt Sugar and Black Jack.	
Cocoa and Chocolate.	Maranta, East India, and Tacca or Tahiti Arrow-roots; Tous les Mois; the Flours of Wheat, Indian Corn, Sago, Potato, and Tapioca, and various Mixtures of these; Sugar, Chicory.	Venetian Red, Red Ochre, and other ferruginous earths.	
Cayenne Pepper	Ground Rice, Mustard Husk, Deal Sawdust, Salt.	Red Lead, Vermilion or Bisulphuret of Mercury, Venetian Red, Turmeric.	
Custard and Egg Powders	Wheat, Potato, and Rice Flours	Chrome Yellow or Chromate of Lead, Turmeric.	
Curry Powder	Ground Rice, Potato-farina, Salt.	Red Lead - - -	Salt.
Flour	- - - - - -	- - - - -	Alum.
Ginger	Wheat, Sago, and Potato Flours, Ground Rice, Mustard Husks.	Turmeric Powder.	
Gin	Water, Sugar - - -	- - - - -	Cayenne, Cassia or Cinnamon. Sugar, and flavouring of different kinds. For fining. Alum, Salt of Tartar.

	For Bulk and Weight.	For Colour.	For Taste, Smell, and other Properties.
LASS	Gelatine.		
	Potato-flour, Water	- - - - -	Salt, Carbonate of Soda, Caustic Lime.
TARD	Wheat-flour, Turmeric	Turmeric.	
	Water	Annatto.	
ALADE	Pulp of Apple or Turnip.		
EAL	Barley-flour, and the integuments of Barley called Rubble.		
TER AND STOUT	Water	Sugar, Treacle	Sugar, Treacle, Salt.
LES	- - - - -	Salts of Copper, usually the Acetate of Copper.	
TED MEATS AND ES.	Flour, probably Wheat-flour boiled.	Bole Armenian, and sometimes Venetian Red.	
SERVES	Salts of Copper, including the Acetate.		
PER	Wheat and Pea Flour, Ground Rice, Ground Mustard Seeds, Linseed Meal, P. D., or Pepper Dust.		
	- - - - -	The Chromates of Potash, Chromate of Lead, ferruginous earths, chiefly Umbers, Red and Yellow Ochre, Red Lead, or Oxide of Lead.	The Chromates of Potash, Carbonate of Ammonia, Lime, Powdered Glass or Silex, Powdered Orris-root.
AR	Wheat-flour in two cases only, Potato-flour, and Tapioca-starch.		
ES:			
OVES	Powdered Clove-stalks in one case.		
NNAMON	Cassia, Wheat-flour, Sago-meal, and mixtures of these; East India Arrow-root, Potato-flour.		
MENTO	Mustard Husk in one instance.		
XED SPICE	Wheat, Sago, and Potato Flours, Ground Rice, Two Vegetable Substances, one of which resembled Linseed.		
TS, as the Es- ences of Ancho- s, Lobsters, Shrimps, and mato Sauce.	- - - - -	Red ferruginous earths, as Bole Armenian and Venetian Red.	
	Exhausted Tea Leaves; Leaves, other than those of Tea, British and Foreign, as, amongst the former, those of Sycamore, Horse-chesnut, and Plum; Lie Tea, Paddy Husk, Sand, Starch.	Plumbago or Black Lead, Gum, Indigo, Prussian Blue, Turmeric, Chinese Yellow, China Clay, Soapstone or French Chalk.	Sulphate of Iron, Catechu, Gum, Le Veno Beno, Chinese Botanical Powder.
ACCO	Water, Sugar, Treacle, and Salts	Sugar, Treacle	Oil.
GAR	Water	Burnt Sugar	Sulphuric Acid.

his Table, as already remarked, does not embrace nearly all the sub-
ces employed in the adulteration of the solids and fluids consumed as
les of food. It contains only those which have actually been dis-
red by ourselves in the several articles subjected to analysis. As soon,
efore, as the remaining Reports have been published, as those on Rum,
ndy, Spirits of Wine, Wine British and Foreign, Cheese, Honey, and
orice, this list will doubtless have to be much extended.

ith the above Table three other lists may be given — the first, of
les ascertained to be used by others; the second, of articles stated to
mployed by different writers, but of the use of which no positive
f is given, although it is highly probable that most of them either
been or are occasionally employed; and the third list, of articles the
f which appears to be but little probable, although stated to be some-
s had recourse to for the purpose of adulteration.

LIST OF ARTICLES ASCERTAINED BY OTHERS TO BE USED FOR THE P OF ADULTERATION.

	For Bulk and Weight.	For Colour.	For Taste, Smell, a Properties.
BREAD	Sulphate of Copper.		
COLOURED SUGAR CONFECTIONERY.	Sap-green.		
FLOUR	Mineral White or Hydrated Sulphate of Lime.		
GIN	- - - - -	- - - -	Grains of Parad phuric Acid, Va Flavourings, c Coriander Seed lica Root, Calan Almond Cake, O Cardamom Seed Peel, Grey an Salts.
LARD	Mutton Suet - - -	Alum, Potash.	
MILK AND CREAM	Flour or Starch, Treacle.		
PORTER AND ALE	- - - - -	- - - -	Cocculus Indicus, Paradise, Capsic ger, Quassia, W Calamus Roo way and Corian Ginger, Orange Liquorice, Hor phate of Iron, Acid, Cream o Alum, Carbona tash, Oyster Hartshorn Shav bia amara or mica, Beans.
SNUFF	Quassia, Gentian and Colombo Root, Peat, Moss, Earthy Matter, Rhubarb Leaves, Leaves of Trees, Fustic Wood.		
TEA	The Leaves of Beech, Plane, Bastard Plane, Elm, Poplar, Willow, Fancy Oak, Hawthorn, Sloe.	Rose Pink, Dutch Pink, Vegetable Red and Yellow Dyes. Chrome Yellow, Venetian Red, Carbonate of Copper, Arsenite of Copper, Chromate and Bichromate of Potash, Carbonates of Lime and Magnesia.	
TOBACCO	Rhubarb, Potato, Coltsfoot, Dock, and other British Leaves, Sawdust, Malt Comings, Earthy Matter, Sand.	- - - -	Nitrate of Soda.

LIST OF ARTICLES STATED BY OTHERS TO BE EMPLOYED FOR THE DIF PURPOSES OF ADULTERATION, BUT OF THE USE OF WHICH NO P EVIDENCE HAS BEEN ADDUCED, ALTHOUGH IT IS EXTREMELY PROBABL MANY OF THEM HAVE BEEN, OR ARE OCCASIONALLY, HAD RECOURSE T

	For Bulk and Weight.	For Colour.	For Taste, Smell, a Properties.
ARROW-ROOT	Ground rice.		
ANCHOVIES	Sprats.		
BREAD	Barley, Oat, Rye, Indian Corn, Bean and Pea Flours, Potato-starch, Pipe Clay, Plaster of Paris, Bonedust.		
COLOURED CONFECTIONERY.	White Potter's Clay, Pipe Clay, or Cornish Clay, Chalk, Plaster of Paris, Sand.	Cobalt. Smalt, Ultramarine.	
COFFEE	Roasted Peas, Coffee Grounds, Parsnip.	Madder Root.	
CHICORY	Torrefied Ground Rice, Roasted Biscuit, Oak Bark Tan, Exhausted Tan, called Croats.	Baked Horse's Liver, Burnt Blood, Litmus, Naples Yellow.	
COCOA AND CHOCOLATE.	Cocoa Shells, Old Sea Biscuits, Coarse branny Flour, Animal Fats, as Tallow, Lard, Treacle, Sulphate of Lime, Chalk.	Red Lead, Vermilion, Red and Yellow Ochre.	

	For Bulk and Weight.	For Colour.	For Taste, Smell, and other Properties.
S - - -	Rye, Indian Corn, Rice, Bean and Pea Flours, Potato-starch, Chalk, Bone Earth, Plaster of Paris, Powdered Flints.		
- - -	- - - - -	- - - -	Acetate of Lead.
ES - - -	- - - - -	- - - -	Common Arsenic and Peroxide of Mercury.
TARD - -	Pea-flour, Linseed-meal, Radish Seeds.		
S - - -	Sheep's Brains, Chalk.		
ER - - -	Ground Oil Cake, Clay.		
PBERRY JELLY -	Currant Jelly - - -	- - - -	Orris-root.
AR - - -	Sand, Plaster of Paris.		
ES - - -	Chalk, Plaster of Paris -	Red Lead.	
ACCO - -	The leaves of Cabbage, Sea-weed, Roasted Chicory-root, Bran, Oakum.	Liquorice, Beet-root Dregs, Catechu, Fuller's Earth.	Sal Ammoniac, Carbonate of Ammonia, Nitrate of Ammonia, Salt, Alkalies, as Potash and Soda, Catechu or Terra Japonica, Opium.
EGAR -	- - - - -	- - - -	Acetic, Pyroligneous, Hydrochloric, Nitric, and Tartaric Acids; Cayenne, Long Pepper, Mustard Seeds, Salt.

ST OF ARTICLES STATED TO BE USED, BUT NOT LIKELY TO BE EMPLOYED, FOR THE PURPOSE OF ADULTERATION.

	For Bulk and Weight.	For Colour.
NCHOVIES - - -	Plaster of Paris.	
UTTER - - -	Lard.	
OFFEE - - -	Madder-root - - - -	Madder-root,
HICORY - - -	Brick-dust - - - - -	Brick-dust.
AYENNE - - -	Brick-dust - - - - -	Brick-dust.
N - - - -	Oil of Turpentine, Oil of Almonds.	
ILK - - -	Milk of Almonds, Gum, Gum Tragacanth.	
ORTER AND ALE - -	Opium.	
INEGAR - - -	Oxalic Acid.	

The following enumeration of the conclusions arrived at in the cases of the ferent articles of consumption submitted to analysis are given in order to con-y some idea of the character and extent of the work, and to enable the reader, th the least possible trouble and loss of time, to become acquainted with the ncipal facts and conclusions contained in the body of the work.

COFFEE, AND ITS ADULTERATIONS.

The conclusions resulting from the Microscopical Examination of the first series amples of Ground Coffee subjected to analysis were as follows: —

That the *Thirty-four* coffees, *with three exceptions, were adulterated.*
That *chicory* was present in *Thirty-one* instances.
Roasted corn in *Twelve.*
Beans and potato-flour each in *One* case.
That in *Sixteen* cases the adulteration consisted of *chicory* only.
That in the remaining *Fifteen* samples the adulteration consisted of *chicory*, nd either *roasted corn, beans*, or *potato-flour*.
That in many instances the quantity of coffee present was very small, and n others, not less than one fifth, fourth, third, half, and so on, of the whole rticle.

From a second series of samples examined at the same time the conclusions wer

1st. That *Eighteen out of the Twenty-samples were adulterated with chicory.*
2nd. That *Four of the samples contained roasted corn in addition to chicory.*

Second Report on Coffee.

The conclusions resulting from this series of examinations were, —

1st. That out of the *Forty-two* samples of coffee submitted to analysis *Elev* *were unadulterated.*

2nd. That *the remaining Thirty-one samples were all adulterated with chicor* which was met with in every proportion, in many cases constituting the chi part of the article.

3rd. That in *Two cases only was any other adulteration than that with chicor* *observed*, one consisting of a *vegetable substance* resembling *horsechesnut*, an the other of some *amorphous substance*, probably used for colouring.

Third Report on Coffee.

ON CANISTER COFFEE.

The conclusions arrived at, were, —

1st. That the whole of the *Twenty-nine* packages, bottles, and canisters of Coffe submitted to analysis, with *a single exception, were adulterated.*

2nd. That in *Twenty-eight* of the samples, the adulteration consisted of *chicory* this root, in many instances, constituting the *chief part* of the article.

3rd. That *Five* of the coffees contained *roasted wheat-farina*, and substance bearing a close resemblance to *mangel-wurzel* and *acorn.*

Fourth Report on Coffee.

The conclusions deduced from the examination of another series of analyses samples of Coffee, made at a later period, were, —

1st. That out of the *Twenty samples* of *coffee* submitted to examination, *Ninete* were adulterated with *chicory.*

2nd. That several of the samples, on incineration, left a coloured residue, fro the *presence of red oxide of iron*, derived from some red ferruginous earth, Venetian Red, employed in the adulteration of the Chicory contained in th Coffee.

Fifth Report on Coffee.

The conclusions deduced from the examination of the Thirty-four samples Coffee purchased shortly after the recent regulation authorising the sale of mix chicory and coffee in labelled packages were, —

1st. That out of the *Thirty-four* samples, ALL PURCHASED AS COFFEE, only *Thr* were genuine, while no less than *Thirty-one* contained various proportions *chicory.*

2nd. That in *Six* of the samples *chicory* was present in the proportion of abo *one-third* of the article.

3rd. That in *Twenty-two* of the samples *chicory* formed about *one-half* of th article.

4th. That *Three* of the samples consisted almost entirely of *chicory.*

5th. That *Thirteen* of the samples were not labelled "Mixture of Chicory an Coffee," and yet *Ten* of these were adulterated with *chicory.*

6th. That the remaining *Twenty-one* samples, notwithstanding that COFFEE WA DISTINCTLY ASKED FOR in each instance, were labelled "Mixture of Chico and Coffee."

Sixth Report on Coffee.

The results obtained by the examination of Thirty-four samples of ground Coffee purchased a few days subsequently at the same establishments from which the previous thirty-four samples were procured, were as follows : —

1st. That of the *Thirty-four* samples, ALL PURCHASED AS COFFEE, *Nine* were genuine, while no less than *Twenty-five* contained various proportions of *chicory.*

2nd. That in *Eight* of the samples *chicory* was present in the proportion of about *one-third* of the article.

rd. That in *Fourteen* of the samples *chicory* formed about *one-half* of the article.

th. That *Three* of the samples consisted almost entirely of *chicory.*

th. That *Two* of the samples were not labelled " Mixture of Chicory and Coffee," and yet were adulterated with *chicory,* the parties — the adulteration being brought home to them — being liable in each case to a fine of one hundred pounds.

h. That of the *Twenty-five* samples containing chicory, notwithstanding that COFFEE WAS DISTINCTLY ASKED FOR in each case, *Twenty-three* were labelled " Mixture of Chicory and Coffee."

Contrasting these two Tables of Analyses, it appears, therefore, as consequences our previous Report, that greater caution is now observed in the sale of mixed icory and coffee without a label, an offence punishable by a fine of one ndred pounds ; also, that a larger proportion of dealers sell the genuine article hen asked for it ; but that the " mixture " is still palmed off as extensively as er upon the public as coffee.

The results of the examination of the *Ten* additional samples purchased as ffee, given in the present Report, were as follow : —

wo were sold as coffee, being labelled " Mixture of Chicory and Coffee ; "
ne was sold as a " Mixture of Chicory and Coffee," which it really was ; and —
even were *genuine.*

SUGAR, AND ITS ADULTERATIONS.

From the examination of Thirty-six samples of Brown Sugar the conclusions rrived at were, —

st. That fragments of *cane,* frequently so minute as to be visible only with the microscope, *were detected in all the sugars except one,* that being a very white sugar, and evidently purified by filtration, so as to cause it to approach in character refined or lump-sugar.

nd. That *the disgusting insects, acari, were present* in *Thirty-five out of the thirty-six sugars,* and in *Nineteen* cases in very considerable numbers.

rd. That *sporules* and *filaments* of fungi were present in at least *Ten* cases.

th. That *grape-sugar was detected in the whole Thirty-six sugars,* often in very considerable amount.

th. That *the whole of the sugars contained a variable proportion* of *vegetable albumen.*

th. That a greater or less number of *pieces of woody fibre were noticed in nearly all the sugars.*

th. That *stony particles or grit were observed in at least Eleven instances.*

th. That a variable quantity of *starch* or *flour was contained in each sample of sugar,* either in the form of free granules, or aggregations of granules and cells.

th. That in *Four* of the sugars the amount of *flour was so considerable, that it had evidently been employed for the purpose of adulteration.*

The results obtained from the examination of Fifteen samples of Lump Sugar, ere,—

1st. That *in none of the sugars were fragments of cane present;* these having been separated by the filtration through charcoal to which sugar in process of refinement is subjected.

2nd. That in *no case were acari observed.*

3rd. That in *Three* of the sugars only were *traces of grape-sugar* to be detected.

4th. That *in none of the sugars were sporules of fungi to be seen.*

5th. That a *variable although a very small quantity of flour was present in the whole Fifteen sugars.*

6th. That *animal matter was observed in Ten cases.*

7th. That *sawdust-like fragments of woody-fibre were present in Twelve cases,* being very abundant in at least *Seven* of the sugars.

Second Report.

From the examination of a second series of Brown Sugars, purchased more recently at different shops, the conclusions were,—

1st. That the *sugar insect,* or *acarus, was present in the whole of the sugars,* the majority of the samples containing them in great numbers.

2nd. That *sporules of fungi were likewise present in all the sugars.*

3rd. That *Two* out of the *Thirty-six* sugars *were adulterated with flour,* one with *tapioca,* and the other with *potato-flour.*

ARROW-ROOT, AND ITS ADULTERATIONS.

The conclusions were,—

1st. That out of the *Fifty* samples of Arrow-root submitted to analysis *Twenty-two were adulterated.*

2nd. That in *Sixteen* cases the adulteration consisted in the addition of a single article, much cheaper in price, and very inferior in quality, to genuine arrow-root; this in *Ten* instances being *potato-flour;* in *Five, sago-meal;* and in *One* case *tapioca-starch.*

3rd. That in *Five* cases it consisted in the employment of two different articles, *potato-flour* and *sago-meal.*

4th. That in *Two* instances *Three* different starches were employed in the adulteration, viz., *potato-flour, sago-meal,* and *tapioca-starch* or *fecula.*

5th. That *Ten* of the arrow-roots contained scarcely a particle of genuine Maranta or West India arrow-root, for which they were sold. *One* consisted entirely of *sago-meal; Two* of *potato-flour* and *sago-meal; Two* of *potato-flour, sago-meal,* and *tapioca starch; One* of *tapioca-starch;* and *Four were composed entirely of potato arrow-root or starch.*

Second Report.

From the examination of a second series of samples of Arrow-root, the conclusions were,—

1st. That no less than *Eighteen,* or one-half the samples, *were either adulterated,* or else some *inferior starch, as potato-flour,* was substituted for the genuine arrow-root.

2nd. That *Five* of the samples consisted almost entirely of *potato-starch.*

3rd. That the remaining *Thirteen* samples consisted of mixtures in various proportions of *potato-starch* and *sago-powder,* (these in some cases forming the chief part of the article,) with occasionally other starches, as *tapioca, cann* and *curcuma starches.*

PEPPER, AND ITS ADULTERATIONS.

From the examination of Forty-three samples of black and white pepper the conclusions were,—

BREAD, AND ITS ADULTERATIONS.

The conclusions were, —

1st. That the whole of the *Twenty-four* samples of Bread examined *were adulterated with alum.*

2nd. That in *no one of the samples was potato, or any other farinaceous matter other than wheat-flour, detected; nor did any of the breads contain either carbonate or sulphate of lime.*

Second Report on Bread.

From the analyses of a second series of Bread made more recently, the conclusions were, —

1st. That the whole of the *Twenty-five* samples examined, including three sold by the *League Bread Company*, contained *alum.*

2nd. That in *none* of the samples was *potato* detected.

FLOUR, AND ITS ADULTERATIONS.

From the examination of eight samples of Flour the important fact was ascertained, —

That four of the flours used by the bakers in whose bread alum had been detected, and who had questioned the accuracy of the analyses, also *contained alum.*

COCOA, AND ITS ADULTERATIONS.

The conclusions arrived at from the analysis of samples of Cocoa were: —

1st. That *Eight* of the Fifty-six samples were *genuine.*

2nd. That *sugar* was present in *Forty-three* samples, the amount forming from 5 to in some cases as much as nearly 50 per cent. of the article.

3rd. That *starch* was detected in *Forty-six* of the samples, the quantity present varying from 5 to nearly 50 per cent., and consisting either of *wheat, potato-flour, sago-meal,* &c., or mixtures of these in various proportions.

Second Report on Cocoa.

The conclusions to be deduced from the examination of the analyses of the above Fifty-six different samples of Cocoa were as follows: —

1st. That out of the *Ten* samples of *flaked cocoa* which were incinerated *Six* contained *earthy colouring matter.*

2nd. That *One* of the two samples of *granulated cocoa* yielded *a coloured ash.*

3rd. That *Two* of the three *Bromas* contained *earthy colouring matter.*

4th. That out of fourteen samples of *soluble cocoa, earthy colouring matter* was discovered in *Thirteen.*

5th. That *Five* of the fourteen *homœopathic cocoas* contained *coloured earth.*

6th. That the two *roll cocoas* were free from earthy colouring matter.

7th. That earthy colouring matter was present in *Seven* of the nine samples of *rock cocoa* examined.

8th. That the *ash* in *One* of the two *cocoa pastes* incinerated was *coloured.*

9th. That of the twelve samples of *chocolate* in *powder* and in *cake* examined, *earthy colouring matter* was present in *Four.*

10th. That out of sixty-eight samples of cocoa and chocolate submitted to examination, *Twenty-nine* were free from admixture with earthy colouring matter, while the remaining *Thirty-nine* samples all contained *coloured earthy substances,* in greater or less amount.

It appears further, —

That the preparations contained in the packages labelled with the names of *wo* preparations of cocoa to which the name of Baron Dupuytren d, *were largely adulterated with red earthy matter.*

o samples labelled Steane, Davis, & Co., *furnished coloured ashes.*

Three packages to which the names of Barry & Co. were affixed, ed a *coloured ash.*

hes of *the whole* of the Seven preparations of cocoa contained in the to which the names of J. S. Fry & Sons were attached, *were coloured er or less extent.*

f the six preparations of cocoa, labelled Taylor Brothers, *contained ouring matter.*

our preparations purchased of the manufacturer, G. B. White, *were ured.*

the samples of cocoa, Four in number, manufactured by D. Dunn, itted to examination, were ascertained to be entirely free from any with coloured earthy matter.

OATMEAL, AND ITS ADULTERATIONS.

lusions resulting from the examination of this article were, —

n, or *more than one half* of the thirty samples submitted to examinre adulterated with large proportions of *Barley Meal*, while others the refuse husk termed *Rubble.*

TEA, AND ITS ADULTERATIONS.

e important conclusions arrived at from the analyses of the different black and green Tea, both as imported and as purchased of dealers in , were as follow : —

f points ascertained with regard to *Black Tea* were, —

he principal black teas — namely, the Congous and Souchongs, arrive untry, for the most part, in a genuine state.

certain descriptions of black tea, as Scented Orange Pekoe and Caper, iably adulterated, the adulteration in general consisting in the glazing aves with plumbago or black lead : the Caper likewise being subject facture, from Assam, are invariably adulterated — that is to say, are glazed with colouring matters of different kinds.

2nd. That the colouring matters used are in general Prussian blue, turmeric-powder, and China clay, other ingredients being sometimes but not frequently employed.

3rd. That of these colouring matters, Prussian blue, or ferro-cyanide of iron, possesses properties calculated to affect health injuriously.

4th. That in this country there is really no such thing as a green tea — that is, a tea which possesses a natural green hue.

5th. That green teas, and more especially the Gunpowders, in addition to being faced and glazed, are more subject to adulteration in other ways than black teas, as by admixture with leaves not those of tea, with paddy-husk, and particularly with Lie tea.

6th. That Lie tea is prepared so as to resemble green tea and is extensively used by the Chinese themselves to adulterate gunpowder tea; it is also sent over to this country in vast quantities, and is employed for the same purpose by our own tea-dealers and grocers.

The above are the more important conclusions as to the condition of black and green teas as imported, but these articles undergo further deterioration in our own country. Thus we have adduced evidence to show, —

1st. That exhausted tea-leaves are frequently made up with gum, &c., and re-sold to the public as genuine black tea, and, when artificially coloured and glazed, even as green tea.

2nd. That the substances employed in the colouring are in many cases very much more objectionable and injurious than those used by the Chinese, being often highly poisonous.

3rd. That it is no uncommon thing for tea, both black and green, to be fabricated from leaves not those of tea, and possessing no properties in common with the leaves of that plant.

4th. That black Lie tea is often coloured and extensively employed by our own dealers and grocers for the adulteration of green tea.

MILK, AND ITS ADULTERATIONS.

The conclusions deduced from an examination of Twenty-six samples of Milk purchased of different milkmen and dairy-keepers resident in London were, —

1st. That *Twelve* were genuine.

2nd. That of these *Two* showed a deficiency of cream.

3rd. That *Eleven* were adulterated.

4th. That this adulteration consisted, in all cases, of *water*, the per-centages of which varied from 10 to 50 per cent., or one-half of the article.

5th. That in no case was *chalk*, *size*, *gum*, *sheep's brains*, or any of the other substances occasionally used for the adulteration of milk, detected.

ISINGLASS, AND ITS ADULTERATIONS.

The conclusions were, —

1st. That out of the *twenty-eight* samples of Isinglass submitted to examination, *Ten*, or more than one-third, consisted entirely of *gelatine*.

2nd. That the price of the genuine isinglass varied from 8*d*. to 1*s*. 4*d*. per ounce; while that of the gelatine ranged between 10*d*. and 1*s*. 4*d*. per ounce.

VINEGAR, AND ITS ADULTERATIONS.

The conclusions resulting from the examination of Thirty-three samples of Vinegar purchased of grocers, oilmen, and publicans, were, —

1st. That the amount of *acetic acid*, the most important constituent of vinegar, varied greatly in different samples; the highest per-centage being 5·10, and the lowest 2·29, or less than half the first amount.

2nd. That since the standard No. 24. vinegars submitted to analysis range, for the most part, considerably over 4 per cent., vinegar to be deemed good ought to contain certainly *not less* than 4 per cent. of real acid.

3rd. Judged by this standard, out of twenty-three samples of vinegar purchased of dealers in London, *Seven* reached this strength and contained from 4 per cent. upwards of acetic acid; the per-centage of *Seven* of the vinegars ranged between 3 and 4; while in the remaining *Nine* the amount of acid varied from 2 to 3 per cent., it being in *Two instances* as low as 2·40 and 2·29.

4th. That *Twelve* samples out of the thirty-three analysed contained no free sulphuric acid, a fact affording convincing proof that the use of this acid, so objectionable in many respects, is not necessary for the preservation of well-made vinegar.

5th. That in *Eight* samples the quantity of sulphuric acid present did not exceed the amount formerly permitted to be added.

6th. That in the remaining cases the amount exceeded this, and in some instances was three or four times as great.

7th. Since the manufacturers prepare and sell vinegar of different qualities, some being very weak, and since, as is well known, they commonly add sulphuric acid, it is clear that the blame of the present unsatisfactory condition of the article lies mainly with them, although no doubt in some cases the retailer takes his part in the work of adulteration and deterioration by the addition of *sulphuric acid, burnt sugar, water, sour beer, and cider.*

Second Report on Vinegar.

The conclusions resulting from the examination of the second series of samples of the Vinegars of the principal manufacturers, twenty-eight in number, were as follows: —

1st. That *Seven* of the samples were entirely free from *sulphuric acid* or *oil of vitriol.*

2nd. That *Twenty-one* were adulterated with that powerful and corrosive mineral acid, the amount of which was variable, and often very considerable; from ·63, the lowest, to 6·02, the highest quantity, in 1000 grains.

3rd. That *Two* of the samples contained it in very small quantity only.

4th. That in *Three* samples it was present in considerable amount.

5th. That *Nine* contained it in very considerable amount.

6th. That in *Seven* samples it was present in immense quantity.

7th. That the *acetic acid* also varied very considerably in amount in different samples, the highest proportion being, in 1000 grains by measure, 56·66 grains, or 5·66 per cent., and the lowest, 27·63, or only 2·76 per cent.

8th. That in *Eight* samples, the acetic acid was present in amount over 5 per cent., which is above the standard strength.

9th. That in *Twelve* samples the quantity exceeded 4 per cent.

10th. That in *Seven* it was over 3 per cent.

11th. That in *One* the quantity of *acetic acid* present was so exceedingly small as to be *under* 3 per cent., — that is, but little more than half the proper strength.

PICKLES, AND THEIR ADULTERATIONS.

The conclusions deduced from the examination of the samples of Pickles were, —

1st. That the *vinegar* used for pickling is of *a very weak description*, the pe centages of *acetic acid* ranging between 1·48 and 2·91, whilst *vinegar of g quality ought to contain from four to five per cent. of pure acetic acid.*

2nd. That *Nineteen* out of the twenty *vinegars* submitted to analysis, poor they were, yet *owed a portion of their acidity to sulphuric acid*, the amount which varied, in the different samples, from ·38 to 2·52 in the 1000 grai *the largest quantity of this acid being detected in the vinegars in which the cabbages were pickled.*

3rd. That, *in the whole of the Sixteen different pickles analysed for copper,* TH POISONOUS METAL *was discovered in various amounts: Two of the sam contained a small quantity; Eight, rather much; One, a considerable quanti Three, a very considerable quantity; in One, copper was present in hi deleterious, and in Two, in poisonous amounts.*

4th. That *the pickles which contained the largest quantity of copper were th which consisted entirely of green vegetables, as gerkins and beans.*

GINGER, AND ITS ADULTERATIONS.

The conclusions were, —

1st. That out of *Twenty-one* samples of ginger submitted to examination, less than *Fifteen*, being more than two-thirds of the whole, were found to *adulterated.*

2nd. That the substances detected were various in character, including *sago- potato-flour, wheat-flour, ground rice, Cayenne pepper, mustard-husks, turmeric-powder,* — these occurring in various quantities, but in the majo of cases constituting the principal part of the article.

CINNAMON, AND ITS ADULTERATIONS.

The conclusions deduced from the examination of Thirty-one sampl Cinnamon were, —

1st. That of the *whole* cinnamons, *Seven* were *genuine* and *Five* consisted nothing but *cassia.*

2nd. That while the prices per ounce for the *whole* cassias varied betw sixpence and one shilling, one being charged sixpence; three, eightpe and one, a shilling; those for the cinnamon also varied between sixpence one shilling; one being charged sixpence; three, eightpence; and three, shilling.

3rd. That out of the *Nineteen* samples of *ground* cinnamon, *Three* consi entirely of *cassia.*

4th. That *Ten* of the samples, or more than one-half, were *adulterated*, the arti most frequently employed being either *baked wheat-flour* or *sago-meal,* parately or in combination; but *East India arrow-root* and *potato-flour* likewise detected, each in one instance.

5th. That of the above adulterated samples, *Three* consisted of *cassia,* terated; and *Seven* of *cinnamon* adulterated.

6th. That *Six* only of the *Nineteen* samples were *genuine.*

7th. That the prices given per ounce for the powdered *cassia,* substituted cinnamon, were sixpence and eightpence, one being sixpence, and two e pence.

8th. That the prices paid for the genuine powdered cinnamon were sixp eightpence, and one shilling per ounce; two being sixpence, three eightp and one a shilling.

9th. That the prices charged for the adulterated articles, whether cassi cinnamon, were fourpence, sixpence, and eightpence per ounce — viz., on fourpence, three at sixpence, and six at eightpence.

NUTMEGS, AND THEIR ADULTERATIONS.

The conclusions arrived at from the examination of Eighteen samples of Nutmegs were, —

1st. That nutmegs as they reach the consumer are not in general deprived of their essential oil; a result contrary to the opinion commonly entertained on this point.

2nd. That, as met with in the English markets, they are seldom limed.

MACE, AND ITS ADULTERATIONS.

The conclusion was, —

That the whole of the *Twelve* samples of Mace examined were genuine.

CLOVES, AND THEIR ADULTERATIONS.

The conclusions deduced from the examination of Twenty-nine samples of Cloves were, —

1st. That whole cloves, as ordinarily met with, are not deprived of any portion of their essential oil.

2nd. That the whole of the powdered cloves were free from adulteration. *One* of the samples contained, however, a proportion of *ground clove-stalks.*

PIMEMTO, AND ITS ADULTERATIONS.

The conclusions were, —

That of the *Twenty-one* samples of ground Allspice submitted to examination, *one only was adulterated;* a result probably mainly attributable to the great cheapness of this spice.

MIXED SPICE, AND ITS ADULTERATIONS.

The conclusions were, —

That of the *Twenty-six* samples of Mixed Spice subjected to microscopic examination, no less than *Sixteen,* or considerably more than one-half, *were adulterated;* and hence it is seen that of all the spices mixed spice is the most liable to adulteration.

PRESERVED PROVISIONS.

The conclusions were, as regards the PRESERVED VEGETABLES, —

1st. That of the three vegetables examined and enclosed in tin canisters, the *carrots* were in a perfectly fresh and sound state; the *turnips* were apparently sound, but when dressed and brought to table were seen to be very much discoloured; the *green peas* were not in a satisfactory state of preservation, being altered in colour, having but little flavour, and evincing signs of incipient decomposition.

2nd. That the vegetable, *rhubarb,* contained in a bottle, and preserved according to the method devised by Mr. Sadlington, was in good condition.

3rd. That the several vegetables preserved under the process of M. Masson — viz., *cabbage, Brussels-sprouts, carrots, potatoes,* and *julienne,* were all sound and fresh, and in admirable condition in all respects.

4th. That the *potatoes* prepared under the patent of Mr. Edwards were likewise in a perfectly satisfactory state.

5th. That the *fruits* put up after the method of Mr. Sadlington were, with one exception, in a good state of *preservation.*

6th. That the *apples* prepared according to the patent of M. Masson, when soaked, as directed, in warm water, possessed the flavour unimpaired of the recent fruit.

With respect to the PRESERVED ANIMAL SUBSTANCES, the conclusions were,—

7th. That *Borden's Patent Meat Biscuit* was in a perfectly sound state, and that there is much reason to regard it as a valuable article of diet in the provisioning of ships, garrisons, &c.

8th. That the *extract of beef*, manufactured under the patent of Mr. Roberton, was free from the slightest taint, and possessed all the odour and flavour, to a remarkable extent, of beef recently roasted.

9th. That the *soups* were, with one exception, in which the article appeared to be in a state of incipient decomposition, of excellent quality, and in sound condition.

10th. That the preservation of the *milk* examined was not entirely successful.

11th. That the three canisters of *fish* were all found to be in excellent condition, the fish being as fresh as on the day they were enclosed in the cases.

12th. That the cases of *boiled and roasted beef* were in good preservation.

13th. That the samples of *pemmican* exhibited no symptoms of change or decomposition.

It appears that out of the *Thirty-four* samples of preserved provisions of all kinds submitted to examination, the condition of preservation of *Twenty-nine* was most satisfactory, the state of *Five* only out of the number being unsatisfactory, three of these being vegetables; and hence we deduce the further conclusion, that the several processes adopted for the preservation of vegetable and animal substances are, at least so far as regards home and domestic use, productive of satisfactory results. From the few cases, however, which have turned out unfavourably, it is evident that the greatest care is requisite in conducting the several steps of the different processes adopted.

Poisonous Cayenne Pepper.

The conclusions deduced were,—

1st. That out of the *Twenty-eight* samples of Cayenne Pepper subjected to analysis, *Twenty-four were adulterated.*

2nd. That out of the above number, *Four* only *were genuine.*

3rd. That out of the *Twenty-four* adulterated samples, *Twenty-two* contained *mineral colouring matters.*

4th. That RED LEAD, often in large and poisonous quantities, was present in *Thirteen* samples.

5th. That *Venetian red*, *red ochre*, or some other analogous ferruginous earths, were contained in *Seven* samples.

6th. That CINNABAR, VERMILION, or SULPHURET OF MERCURY, was detected in *One* sample.

7th. That *Six* of the samples consisted of a mixture of *ground rice*, *turmeric*, and *cayenne*, coloured with either *red lead* or a *red ferruginous earth.*

8th. That *Six* samples contained large quantities of *salt*, sometimes alone, but more frequently combined with *rice* and a *red ferruginous earth* or with *red lead.*

9th. That *One* of the samples was adulterated with a large quantity of the *husk of white mustard-seed.*

10th. That *Two* contained *rice* only, coloured with *red lead* or a *ferruginous earth.*

CURRY POWDER.

The conclusions arrived at from the examination of Twenty-six samples of Curry Powder were,—

1st. That *Seven* only were *genuine.*

2nd. That *Nineteen,* or nearly four-fifths, were *adulterated.*

3rd. That *ground rice,* usually in very large quantities, was present in *Nine* samples.

4th. That *potato-farina* was detected in *One* sample.

5th. That *salt* was present in *Eight* of the samples.

6th. That the highly poisonous metallic oxide, RED LEAD, was detected in no less than *Eight* of the samples.

7th. That in *Seven* of the samples, the adulteration consisted of *ground rice* only.

8th. That in *One* sample the adulteration consisted of *ground rice* and *salt.*

9th. That in *One* sample the adulteration consisted of *ground rice* and RED LEAD.

10th. That in *Three* samples, the admixture consisted of *salt* only.

11th. That in *Three* samples, the adulteration consisted of *salt* and RED LEAD.

12th. That in *Three* samples, the adulteration consisted of RED LEAD only.

13th. That in *One* sample, the adulteration consisted of RED LEAD, *potato-farina,* and *salt.*

POISONOUS BOTTLED FRUITS AND VEGETABLES.

The conclusions were,—

1st. That of the *Thirty-three* samples of Preserved Fruits and Vegetables *Seven were free from contamination with copper.*

2nd. That *Twenty-seven* samples *were more or less impregnated with that metal.*

3rd. That *traces of copper were discovered* in *Three* of the samples.

4th. That in *Seven* of the samples *copper was present in small amount only.*

5th. That *Eight* samples contained it *in considerable amount.*

6th. That in *Six* samples the metal *was present in very considerable amount.*

7th. That *Four* of the samples contained this poisonous impregnation *in very large quantities.*

8th. That the samples of *limes contained copper,* the one in *small amount* only, the other in *amount more considerable.*

9th. That *gooseberries* as commonly preserved contain *a considerable amount of copper, and some samples even a very large quantity.*

10th. That *rhubarb* usually contains an amount of copper *more considerable, some samples being contaminated with it to a very large extent.*

11th. That *greengages* in general contain *a still greater quantity of copper,* the metal being frequently present *in highly dangerous amounts.*

12th. That in *olives* this *poisonous impregnation is in the largest amount,* although its effect in heightening the colour of the fruit is less marked than in the other cases.

13th. That the preserved *red fruits,* as currants, raspberries, and cherries, are *not as a rule contaminated with copper.*

ANCHOVIES, THEIR SUBSTITUTIONS AND ADULTERATIONS.

The conclusions resulting from the examination of Twenty-eight samples of Anchovies were,—

1st. That *Seven* of the samples consisted entirely of DUTCH FISH.

2nd. That *Two* of the samples consisted of a mixture of DUTCH FISH and anchovies.

3rd. That the brine in *Twenty-three* of the samples was charged with either *bol* *Armenian* or *Venetian red,* the quantity varying considerably in amount, but in most cases the brine was charged with these earthy powders to such an extent that they might be obtained and collected from the bottom of th bottles almost by tea-spoonfuls.

POTTED MEATS AND FISH, AND THEIR ADULTERATIONS.

The results obtained from the examination of these articles were,—

1st. That the samples of *Potted Tongue* and *Ham* were entirely free from adu teration.

2nd. That *Four* out of the *Five* samples of *Potted Beef* were artificially colour by means of the red earth, *bole Armenian.*

3rd. That the *whole* of the samples of *Potted Bloaters* examined were high coloured with the before-named earthy substance.

4th. That *One* of the samples of *Bloater Paste* was adulterated in addition wi a large proportion of *starch* or *flour,* probably wheat-flour boiled.

5th. That the *entire* of the samples of *Anchovy Paste* analysed were still mo highly, and even vividly, coloured with very large quantities of *bole Armeni*

6th. That *Two* of the *Anchovy Pastes* were in addition adulterated with *flour* one with a large per-centage of *wheat-flour.*

7th. That of the *Twenty-eight* samples of *Potted Meats* and *Fish* subjected t analysis, no less than *Twenty-three* were more or less impregnated with th red earthy material, *bole Armenian.*

SAUCES, AND THEIR ADULTERATIONS.

From the examination of Thirty-three samples of Sauces the conclusi were,—

1st. That *treacle* and much *salt* formed the bases of the *Five* samples of Im SOY examined, if they did not even entirely consist of these two ingredients,

2nd. That in LAZENBY'S HARVEY'S FISH SAUCE much *oxalate of lime,* an numerous minute chips of *charred deal,* were detected, the presence of th last affording some countenance to the inference that they had been used the purpose of imparting colour to the sauce.

3rd. That of the *Seven* samples of TOMATO SAUCE analysed, *Six* were artifici coloured, *One* probably with *cochineal,* and the rest by the addition of co siderable quantities of the ferruginous pigment *bole Armenian.*

4th. That the samples of ESSENCE OF LOBSTERS examined were almost saturat with very large quantities of *bole Armenian.*

5th. That the samples of ESSENCE OF SHRIMPS were saturated to an equal exte with *bole Armenian.*

6th. That the *whole* of the samples of ESSENCE OF ANCHOVIES analysed we adulterated with immense quantities of the ferruginous oxide *bole Armenian.*

7th. That *Three* of the samples of *Essence of Anchovy* contained but a sm quantity of *muscular fibre.*

8th. That *Two* of the samples contained a proportion of *flour* — one being sample of essence of shrimps, and the other of essence of lobster.

9th. That out of the *Eighteen* RED sauces submitted to examination, no less th *Sixteen* contained *bole Armenian,* and this usually in immense quantities, exceeding what was detected in any of the potted meats and fish.

10th. That LEAD, for which separate analyses were made in each case, *was* *detected in a single instance.*

11th. That *traces only of* COPPER *were discovered in some Three or Four sampl*

PRESERVES AND JAMS.

The conclusions obtained from the examination of the different kinds of Preserves and Jams were,—

1st. That the *Raspberry Jam* analysed contained a very considerable quantity of COPPER.

2nd. That the *Four* samples of *Gooseberry Jam* examined all contained COPPER.

3rd. That copper, sometimes in large amount, was detected in *Twelve* of the *Fourteen* samples of *Orange Marmalade* analysed.

4th. That *Three* of the *Marmalades* were adulterated with large quantities of *a vegetable substance,* most probably either *turnip* or *apple.*

5th. That the *Nine* samples of *Greengage Jam* were all more or less impregnated with COPPER, it being present in considerable amount in *Five* of the samples.

6th. That the *Greengages* contained in *Three* different boxes of *Crystallised Fruits* all owed their deep green colour to the presence of COPPER.

7th. That the *Limes* and *Greengages* present in a little glass jar of fruit preserved in jelly, also owed their brilliant colour to a salt of COPPER.

8th. That COPPER was present in the three samples of *Candied Citron Peel* subjected to analysis.

9th. That COPPER was detected in no less than *Thirty-three* of the *Thirty-five* samples of different preserves analysed: *Three* contained *traces* only; in *Eleven* the metal was present *in small quantity;* and in *Nineteen* either in *considerable,* or even *very large amount.*

LARD, AND ITS ADULTERATIONS.

The conclusions in this case were,—

1st. That Lard is not unfrequently *extensively adulterated,* the ingredients employed being *water* and *potato-flour,* as well as certain saline substances, as *salt, potash-alum, carbonates of potash* and *soda,* and *caustic lime,* these being intended either to cause the lard to hold water, or to improve its consistence and colour.

2nd. That the description of lard most liable to adulteration is *keg-lard,* and, of this, particularly that which is manufactured in England, Irish keg-lard being but rarely adulterated.

3rd. That of upwards of *one hundred* samples of lard submitted to examination, and procured chiefly from retail dealers, *seven* only were found to be adulterated.

BUTTER, AND ITS ADULTERATIONS.

It appeared from the examination of the various samples of Butter,—

1st. That all the *salt butters* examined contained variable and usually very large quantities of *water,* the amount ranging, with one exception, from 8·48 to 28·60.

2nd. That the *fresh butters* likewise contained variable and often considerable quantities of *water,* but in most cases very much less than in the salt butters, the quantities ranging from 4·18 to 15·43.

3rd. That the quantity of *salt* contained in the *salt butters* varied from 1·53 to 8·24, showing that no fixed rule is acted upon in salting butter.

4th. That in the *fresh butters* the salt varied from 0·30 to 2·91.

5th. That the per-centages of butter contained in the samples ranged from 67·72 to 96·93; that is, some of the samples contained 20, 30, and in one case even nearly 35 per *cent. of water and salt.*

Tobacco, and its Adulterations.

The results obtained from the numerous analyses, chemical and microscopical, instituted of the various descriptions of Tobacco were to the following effect:—

1st. That the *Tobacco-leaf* itself presents certain peculiarities of structure, by which it may be readily distinguished from the leaves of all other plants said to be employed in the adulteration of tobacco, especially in the form and structure of the hairs, and of the mid-ribs and veins. These peculiarities are so decisive as to enable the observer, by means of the microscope, at once to distinguish tobacco in all the forms of cut and roll tobacco, and even when the leaf is still more minutely divided, as in some kinds of snuffs.

2nd. That the majority of leaves not tobacco which have been detected from time to time in adulterated tobacco also present certain peculiarities in their organisation, by which they may be all distinguished, not only from tobacco, but from each other.

3rd. That while the structure of the tobacco-leaf is constant, its composition varies very greatly, particularly as regards the quantity of gum and sugar which it contains, and the amount of ash furnished on incineration: thus we find that in the six samples of unmanufactured *leaf tobacco*, the amount of hygrometric moisture varied from 10·8 to 13·4 per cent.; the extract from 40·8 to 60·0 per cent.; the sugar from mere traces to 3·6 per cent.; the gum from 7·4 to 10·1 per cent.; and the ash from 10·6 to 22·6 per cent., it being composed chiefly of chlorides, sulphates, carbonates, and phosphates, combined with much lime. In the eight samples of *leaf-stalk*, the analyses of which are now given, the hygrometric moisture varied from 11·60 to 18·16 per cent.; the extract from 21·04 to 39·85 per cent.; the sugar from traces to 4·91 per cent.; and the ash from 20·00 to 28·24, these ashes being remarkable for the large amount of soluble salts which they contained. These differences are evidently so considerable and so varied, as to render it manifest, that by imitating its chemical composition, tobacco may be adulterated to a considerable extent without the possibility of our being able to declare with certainty that it is so adulterated.

4th. That in the *Unmanufactured Tobaccos*, including stalk,

The hygrometric moisture varied from 11·25 to 22·96 per cent.
The extract, from 23·20 to 51·20.
The soluble ash, from 3·00 to 11·44.
The insoluble ash, from 9·60 to 17·80.
The total ash, from 13·60 to 27·90.
The sugar, from traces, to 4·91.

5th. That in the *Manufactured Tobaccos*,

The hygrometric moisture varied from 9·80 to 65·76.
The extract, from 29·32 to 62·20.
The soluble ash, from 3·24 to 7·60.
The insoluble ash, from 9·20 to 16·24.
The total ash, from 14·68 to 20·80.
The sugar, from traces, to 3·82.

6th. That in the *Bird's Eye Tobaccos* the soluble ash was very high, in consequence of the large quantity of mid-ribs which these tobaccos contain.

7th. That the extract from the *Negroheads and Twists* was in some cases unusually high, as was also the quantity of glucose: these large extracts were probably, in part, due to the oil employed in the manufacture of these kinds of tobacco, but principally to the use of some saccharine solution.

8th. That not one of the *Forty Samples* of manufactured cut tobacco was adulterated with any foreign leaf, or with any insoluble or organic extraneous substance of any description other than with sugar or some other saccharine matter, which there is good reason to believe was present in several instances. The more common adulterations of tobacco consist in the addition of water, sugar, and salts. The presence of these in amount sufficient to constitute adulteration can only be declared with certainty, however, when they are in considerable excess, or by a comparison of the unmanufactured and manufactured leaf.

Cigars and Cheroots, and their Adulterations.

The conclusions arrived at from the examination of the Fifty-eight samples of Cigars were, —

1st. That cigars and cheroots are but little subject to adulteration, the cheap penny cigars, even, consisting, in the majority of cases, entirely of tobacco, although no doubt of tobacco of very inferior quality. Cigars are, however, now and then met with, especially on race-courses, at fairs, &c., made up of Hay and Brown Paper.

2nd. That notwithstanding the generally received opinions, *Opium* was not detected in any of the twelve samples of Manilla cheroots analysed.

Snuff, and its Adulterations.

From the examination of Forty-three samples of Snuff of different kinds the conclusions were,—

1st. That *chloride of sodium or salt* is added in large and very variable quantities to all descriptions of snuff, the proportion ranging from 1·0 to as much as 12·8 per cent. Where the amount of chloride is less than 1·0 per cent., it is probable that it is derived from the tobacco itself, as well as the water used to moisten it.

2nd. That the *alkaline and earthy carbonates*, chiefly the *carbonates of potash and lime*, are likewise added to snuff, sometimes in considerable quantity, but usually to a less extent than chloride of sodium. One of the samples yielded 3·9.

3rd. It would appear also that in some cases the *alkaline and earthy phosphates* are in excess in snuff, as much as 7·0 per cent. of the former having been detected in *One* of the samples and 4·8 per cent. of the latter in another.

4th. That the *alkaline sulphates* are likewise somewhat in excess, amounting in *One* sample to 5·4 per cent.; in this case the addition may have been intentional.

5th. That *oxide of iron* derived from different descriptions of coloured ferruginous earths, as *red ochre*, *yellow ochre*, and some of the brown earths, as *umber*, was present in upwards of *Two-thirds* of the samples, amounting in *One* case to no less than 5·0 per cent. While all the Scotch snuffs contained iron, the oxide of that metal was not present in any of the samples of Welsh and Irish snuffs submitted to analysis. *The presence of the above-named ferruginous earths constitute so many adulterations.*

6th. That *chromate of lead* was detected in *Nine* of the samples, amounting in *One* instance to 4·6 per cent. It occurred in *Five* out of the *Nine* samples of Scotch snuff examined, in *One* of the *Four* samples of Welsh, and in *One* of the *Three* samples of Irish snuff submitted to analysis. *The presence of this metallic compound in snuff constitutes an adulteration.*

7th. That *oxide of lead*, probably in the form of *red lead*, was discovered in *Three* cases, as much as 3 per cent. being found in *One* of the samples of Hardham's 37. *The presence of this metallic oxide is also an adulteration and an infraction of the Tobacco Act.*

8th. That *bichromate of potash* was present in *Three* of the samples; in *Two* cases it was found in the Scotch snuff, amounting in *One* sample to 6·2 per cent. *The presence of this salt likewise constitutes an adulteration.*

9th. That many of the samples contained a considerable quantity of *silica*, amounting in *One* instance to no less than 8·4 per cent. *In some of the samples the addition was no doubt intentional. Genuine tobacco rarely contains more than 3·4 per cent.*, and usually much less. In most of the siliceous residues of the ashes, *shiny particles* were observed, which under the microscope presented all the appearances of POWDERED GLASS.

10th. That *powdered orris-root* was detected in *Two* of the samples. *The presence of this in snuff is likewise an adulteration.*

11th. That the *total weight of ash* furnished by the incineration of the greater number of the snuffs examined, although many of them were very moist, much exceeded that of genuine tobacco after being dried. While the *ashes* of samples *of the latter have been found to vary in weight from* 10·6 *to* 22·6, those of the snuffs which were not dried, and many of which contained *large percentages of water*, were in no case under 18·26 per cent., while in one instance it amounted to 35·54 per cent. Had the snuffs been dried before analysis, as was the tobacco, the difference in the weight of the ashes would have been much more evident. The average proportion of water in the moist snuffs is about 25 per cent.

Looking then at the whole of the above results, it is evident *that snuff is subject to a very large amount of adulteration, and that of a kind which is not only detrimental to the revenue but highly injurious to health.*

Poisonous Coloured Sugar Confectionery.

From the examination of upwards of one hundred samples of Coloured Sugar Confectionery, the following important conclusions and particulars were arrived at: —

The principal colours employed are yellows, reds, including pink and scarlet, browns, purples, blues, and greens.

Of the yellows it appeared —

That *Seven* were coloured with LEMON CHROME or the pale variety of CHROMATE OF LEAD.

That *Five* were coloured with ORANGE CHROME or the deep variety of CHROMATE OF LEAD.

That *Forty-seven* were coloured with the bright or canary-coloured variety of CHROMATE OF LEAD.

That *Eleven* of the samples were coloured with GAMBOGE.

While the colour of the majority of the above samples was confined to the surface, in many cases it was diffused equally throughout the whole mass of the sugar used.

Of the reds —

That *Sixty-one* of the samples were coloured with *organic pink* colouring matters, consisting in most cases of *Coccus Cacti*, or *cochineal*.

That in *Twelve* of the samples, the colouring matter was RED LEAD, RED OXIDE OF LEAD, or MINIUM.

That in *Six* cases, the colouring ingredient consisted of VERMILION, CINNABAR, or BISULPHURET OF MERCURY.

Of the browns —

That *Eight* were coloured with *brown ferruginous earths*, either *Vandyke brown, umber, or sienna.*

Of the purples —

That two samples were coloured with a mixture of *Antwerp blue,* which consists principally of Prussian blue, and an organic red pigment, most probably *cochineal.*

Of the blues —

That one was coloured with *indigo.*

That *Eleven* were coloured with *Prussian blue,* or *ferrocyanide of iron.*

That *Eleven* were coloured with *Antwerp blue,* which is a modification of *Prussian blue.*

That in *Fifteen* samples the colouring matter consisted of GERMAN OR ARTIFICIAL ULTRAMARINE, which is a sulphuret of sodium and aluminium.

Of the greens —

That *Five* samples were coloured with the *pale variety* of BRUNSWICK GREEN.

That *Four* were coloured with *middle* BRUNSWICK GREEN.

That *One* was coloured with the *deep variety* of BRUNSWICK GREEN.

These greens consist of a mixture, in different proportions, of the CHROMATES OF LEAD and *Prussian blue.*

That one sample was coloured with VERDITER OR CARBONATE OF COPPER.

That *Nine* were coloured with SCHEELE'S GREEN, EMERALD GREEN, OR ARSENITE OF COPPER.

The above colours were variously combined in different cases; as many as three, four, five, six, and even seven colours occurring in the same parcel of confectionery, including three and even four poisons.

That in *Four* of the samples, the colours used were painted on with WHITE LEAD, OR CARBONATE OF LEAD. This was the case in all the cake ornaments.

It further appears from the above Analyses —

That *Thirteen* of the samples were adulterated with *hydrated sulphate of lime,* the quantity varying from 4·3 to 43·66 per cent.

That *Twenty-one* of the samples were adulterated with different kinds of *Flour,* in quantities varying from 1·66 to 25·56 per cent. In *Seventeen* samples the farina consisted of *wheat-flour;* in *Three,* of *potato-flour;* and in *One,* of *East India arrow-root.*

PORTER AND STOUT, AND THEIR ADULTERATIONS.

The following are the conclusions arrived at from the analyses instituted of samples of London Stout and Porter obtained from the taps of the several London porter-brewers, and from publicans: —

That the samples of STOUT either obtained from agents, or purchased at the taps of several of the principal London porter-brewers, were considerably stronger than those procured from publicans: the alcohol, of specific gravity ·796, temperature 60° Fahr., contained in the former samples, ranged from 7·15 per cent. the highest, to 4·53 the lowest; whereas that of the stouts procured from publicans varied, with one exception, from 4·87 per cent. to 3·25 per cent.

That the same difference of strength also characterised the various samples of PORTER procured from the two different sources; the amount of alcohol in the porters obtained from the taps varying from 4·51 per cent. to 2 42 per cent.; whereas those purchased of publicans ranged from 3·97 per cent. to 1·81 per cent.

That in nearly all the stouts and porters *salt* was present, often in considerable amount.

That in some of the samples *cane-sugar* and *treacle* were likewise present.

There is reason to believe that the variation of strength would have been st more considerable had the samples been procured direct from the several breweri instead of, as in most cases, from the brewers' taps.

This diminution of strength in the beer purchased of publicans is only to b satisfactorily explained by the addition in many cases of water, this addition bei no doubt sometimes practised by the publicans and other retailers of malt liquor

The addition of water constitutes the principal, but not the only, adulteratio to which these beverages are subjected.

Thus the addition of water reduces the strength, flavour, and colour, to suc an extent as to necessitate in some cases the further adulteration of the beer, an this is usually effected by means of a very coarse description of brown suga containing much treacle, and known as *Foots*, and salt.

Since the use of cane-sugar is permitted in the brewery, we did not attempt t ascertain which of the samples subjected to analysis contained that substanc because, had we found it in any of the samples, we should still have been unabl to have declared whether the brewers or the publicans were the parties who mad use of it. We believe, however, that the brewers do not often employ suga since it is alleged that beer made with any considerable proportion of cane-sug does not keep so well as that prepared from malt only. Moreover, the pri of sugar forms an obstacle to its use in breweries.

It appears, from the analyses, that salt is almost constantly present in porte This addition we know is made in the first instance by the brewers themselves; but there is also no doubt that a further quantity of it is frequently used by t publican to assist in bringing up the flavour of beer which has been reduced strength by the addition of water. The quantity of salt contained in porter often sufficiently large to communicate a perceptibly saline taste to the mou The salt is used by the brewers in the following manner:—It is first mixed in a tub with flour, usually wheat-flour, and the mixture is cast by handfuls o the surface of the wort in the cooling vat. It is said to assist in the preservat and fining of the wort, and it is alleged that these are the only purposes which it is employed by the brewer.

The three usual and principal adulterations of porter consist, then, of wat by which its strength is reduced and its bulk increased, and sugar and s whereby its colour and flavour are in a measure restored. But there is good rea for believing, from evidence given before a recent Committee of the House Commons on Public Houses, of which Mr. Villiers was the chairman, that o adulterations are practised, and that sulphuric acid, or oil of vitriol, salt of st or sulphate of iron, and cocculus indicus, are likewise not unfrequently u and this both by the publican and the brewer.

Not only is the fact of the addition of water proved by the present analyses, evidence of another character has been supplied by different parties to the Co mittee above referred to, showing the same fact. In particular, it has b proved that a publican could not afford to sell porter at the price which he p for it, in the state in which it is supplied to him by the brewers, and reali profit upon it, unless he had recourse to adulteration.

GIN, AND ITS ADULTERATIONS.

The following important conclusions respecting the adulteration of Gin w established from the numerous analyses made of that article:—

1st. That the *strength* of the various samples ranged from 15,645 grs. to 34, per imperial gallon; the per-centages ranging from 22·35 to 48·80 per cen It thus appears, that some of the spirits contained only half as much alc as was present in some of the other samples, and therefore that their comm cial value was reduced to the enormous extent of more than one half; thus, supposing sample 2. to be worth 12*s*. per gallon, sample 35. would be worth less than 6*s*. per gallon. This variation in the strength of the spirits is doubtless principally attributable to dilution with water.

2nd. That the quantity of sugar ranged from 3 oz. 4 dr. 23 gr. to 13 oz. 4 dr. 13 gr. per gallon.

3rd. That *Two* of the samples contained *Oil of Cinnamon*, or probably of *Cassia*.

4th. That *Seven* of the samples contained CAYENNE PEPPER, some of them in very large quantity, so that the syrupy extract left on evaporation possessed a burning and fiery taste.

5th. That in no case was *Sulphuric Acid* detected; its absence being sufficiently shown by all the samples being neutral to test-paper.

6th. That most of the samples contained combined sulphates, derived from the water and alum employed in their adulteration and clarification. In some few cases, possibly, the combined sulphates may be derived from white vitriol, white copperas, or sulphate of zinc, which we have the authority of a gin distiller for stating is commonly used, when gin has been diluted with water for the purpose of causing it to "bead," as it is technically termed. Here, again, then, we have obtained evidence of a second adulteration calculated to prove injurious to health.

A few remarks may next be bestowed upon the parties who practise and are guilty of the adulterations described. Abundant evidence is afforded in the pages of this work to show that the manufacturers, roasters, and grinders of articles of consumption, including drugs, are the chief offenders. Thus, the adulterations of roasted Chicory-powder, many of those of roasted Coffee and Cocoa, are the work, in most cases, of chicory and coffee roasters and grinders; the woody fibre or saw-dust of different kinds, as well as many of the other adulterations detected in Spices and in various Drugs in powder, are mostly added by the spice and drug grinders; while the copper in Pickles and bottled Fruits, the bole Armenian and Venetian red in potted Meats and Fish, are all added by the different manufacturers and preparers of these articles. These and many other adulterations practised are of a kind which it would be almost impossible for the retail tradesman to practise, special machinery being required for the purpose in some cases. Nevertheless, the latter does his part in the way of adulteration, although to a much less extent. This distinction is important, because it points to the direction in which the chief efforts for the suppression of the different kinds of adulteration discovered should be directed.

We will now turn to the consideration of the subject of Adulteration in some of the other aspects or bearings in which it presents itself to our notice, viz., the *pecuniary* and *fiscal*, the *sanitary* and the *moral aspects.*

The pecuniary considerations involved in the question of the adulteration of the solids and fluids consumed are of very great importance; they affect the buyer, the seller, and the revenue.

The interest of the buyer or consumer, in the pecuniary bearing of this question, is very great. All articles of consumption are divisible into two classes — those which pay a duty to the state, and those which are free of duty: on both these classes the consumer is a great loser, through t tice of adulteration now so disgracefully prevalent. We complain, without some reason, of the largeness of our taxes; but there i cause to believe that the losses of the consumer, arising out of adul amount to more than the sum of his taxes. This is certainly the regards the humbler classes, the labourer, and the artizan; and thi tice, therefore, presses with peculiar hardship upon them. The an article being comparatively less an object to the rich than the p former usually go to the best shops, where, by paying high prices, t generally, but not always, tolerably sure of procuring a good and article; but to the great mass of the public the cost is a primary consid and in too many cases they buy their articles where they profe cheapest, with but little thought as to their quality or purity, and perceiving that these apparently cheap articles, in consequence of ation, are often the dearest in the end. The poor man, then, un rich, can scarcely help himself in the matter. So much for the pe interest of the consumer in the question of the adulteration of foo will now bestow a few reflections upon that of the seller.

It is clear that the sellers of adulterated articles of consumption, manufacturers or retail dealers, are in a position to enhance their by the practice of adulteration, and are enabled to undersell, and t to ruin, their more scrupulous and honest competitors. The questio adulteration of food is, therefore, one which vitally affects the inte the more honest and respectable portion of the trading communi depend upon the manufacture and sale of articles of consumption, behoves them strenuously to exert themselves to put an end to the of adulteration which is so calculated to undermine the very found trade, viz., faith in commercial integrity.

The pecuniary interests of the State in this question will be best ated by an examination of the following Table, which contains articles, nearly all of which we have adduced evidence to show are to great and varied adulteration; also the duties charged, the qu consumed, and the revenue derived from them for the year 1853:—

LIST OF ARTICLES SUBJECT TO ADULTERATION, THE DUTY CHARG
QUANTITIES CONSUMED, AND THE REVENUE DERIVED FOR THE YEAR

Articles.	Duty.	Quantity on which Duty was paid.	Revenue
			£
Arrow-root - -	4½*d.* per cwt. - -	16,757 cwts.	384
Brandy - .. -	15*s.* per proof gallon -	1,870,567 gal.	1,402,925
British Spirits:			
England - -	7*s.* 10*d.* per proof gallon.	10,350,307 gal.	4,053,870
Scotland - -	4*s.* 8*d.* „ „ Now 5*s.* 8*d.* „ „	6,534,648 gal.	1,524,751
Ireland - -	3*s.* 4*d.* per proof gallon. Now 4*s.* „ „	8,136,362 gal.	1,356,060

Articles.	Duty.	Quantity on which Duty was paid.	Revenue derived.		
			£	s.	d.
r - -	5s. per cwt., foreign. British Posses. 2s. 6d. cwt.	397,911 cwt.	131,756	0	0
- - -	3d. per lb. - - -	37,091,814 lbs.	462,747	13	6
ry:					
sted or ground	4d. per lb. - - -	765 lbs.	14	0	0
r or kiln-dried -	4s. per cwt. - -	1,750 cwt.	512	0	0
, foreign - -	9s. per lb. and 5 per cent.				
Paste or Cho-te.	1d. per lb. - - -	15,128 lbs.	226	0	0
e - -	2s. 6d. per cwt. foreign, and 1s. 6d. British.	383,622 cwt.	59,488	0	0
or meal of all ds.	4½d. per cwt. - -	4,662,948 cwt.	532,692	0	0
r, raw -	Foreign 10s. per cwt. - Colonial 5s. per cwt. -	17,577 cwt.	4,602	0	0
ass - - -	5s. per cwt. - -	554 cwt.	138	0	0
r - - -	6d. per lb. and 5 per cent.	3,461,333 lbs.	86,533	6	6
foreign - -	6s. per lb. and 5 per cent.				
- -	British Colonial 10s. per cwt., and varying rates according to quality. Foreign, 12s. per cwt., and ditto, ditto.	7,523,187 cwt.	4,104,376	0	0
ses - - -	3s. 9d. and 4s. 6d. per cwt.	846,722 cwt.	172,816	0	0
, viz.,—					
ves - -	2d. per lb. - - -	228,837 lbs.	109,137	0	0
sia - - -	1d. per lb. - - -	136,363 lbs.			
namon - -	2d. per lb. - - -	37,694 lbs.			
ento - -	5s. per cwt. - - -	3,746 cwt.			
megs - -	1s. per lb. - - -	208,198 lbs.			
ce - - -	1s. per lb. - - -	23,558 lbs.			
- - -	8s. 2d. per proof gallon.	3,233,059 gal.	1,320,165	15	2
- - -	1s. 10d. per lb. - -	58,860,127 lbs.	5,686,194	0	0
co - - -	3s. and 5 per cent. per lb.	- - -	4,751,780	0	0
			including cigars and snuffs.		
- -	5s. 6d. per gallon foreign, and 5 per cent. 2s. 9d. Cape and Colonial, and 5 per cent.	7,197,572 gal.	2,036,083	0	0
ar - - -	3d. per gallon foreign. Now 4½d.	74,773 gal.	87	0	0

s not possible to estimate with any degree of accuracy the loss to the arising out of Adulteration, but it is very evident from the above as well as from the revelations contained in this work, that that loss be great indeed, and must amount annually to many hundreds of nds of pounds. The cost of the Customs and Excise, to which are entrusted the collection of the Revenue, and the prevention of dulteration of exciseable articles, amounted, in 1843, to no less a han 4,031,633*l.* 16*s.* 7½*d.* Of this sum 1,886,250*l.* 0*s.* 1*d.* should be ted for charges connected with the various taxes: this leaves a e of 2,145,383*l.* 16*s.* 6½*d.*; *viz.* for the Customs 1,302,720*l.* 12*s.* 3*d.*, r the Excise 842,663*l.* 4*s.* 3½*d.*; a great part of which expense is ed for the protection of the Revenue against adulteration. How one e bodies performs its duties will hereafter appear.

It must be recollected that in the foregoing Table the latest duties o
are given; and since many of these have recently been greatly reduc
there is no doubt but that the loss from adulteration was formerly m
greater than at present.

Now, we think it would not be difficult to show that the machinery
operation for the purpose of checking adulteration, viz., the Excise, is
clumsy and inefficient as it is expensive. We make this remark, not ou
any hostile feeling towards the Excise, but, as we conceive, as a matte
truth and right.

We have said that the Excise is inefficient. In proof of this statem
we have only to refer to the pages of this work, demonstrating as they
beyond the possibility of a doubt, the fact, that adulteration is scandalo
and disgracefully prevalent in nearly every duty-paying article: take,
example, coffee, chicory, spirits, tobacco, spices, snuff, and other lead
and prime exciseable articles.

And why is the Excise thus inefficient? and why has it not accompli
the purposes for which it was instituted? There are several rea
One of them is a want of sufficient vigour and activity in enforcing
powers with which they are entrusted. Compared with the extent of
prevalence of adulteration how seldom do they institute prosecutio
Another reason is, that they do not sufficiently employ the resource
science for the discovery of adulteration. They rely too much upon
information of excise inspectors, and too little upon science, upon
resources of chemistry, more particularly of organic chemistry, and e
cially upon a knowledge of vegetable structure as revealed to the compe
observer by means of the microscope. Hence it is, that we, emplo
these resources, have so often succeeded in bringing to light adulterat
of the very existence and nature of which the excise authorities themse
had been wholly ignorant.

We have said that the machinery of the Excise is not only ineffic
but that it is clumsy: let us see what is the nature of the machiner
question. Excise inspectors or officers are appointed to watch over
operations of all the manufactories of the kingdom in which article
consumption that pay duty are prepared, and to see that prohibited s
stances are not employed. In some cases the exciseman almost lives u
the premises, staying there the whole day, and when he leaves at nigh
locks up certain parts of the manufactory, and takes the key with h
thereby stopping to some extent in many cases the productiveness of
manufactory. That this is an inquisitorial and a very arbitrary proces
few will deny; but another evil springing out of the residence of excise
upon the premises of a manufacturer is, that after a time in too m
cases intimate relations come to be established between the exciseman
the manufacturer, and he is frequently brought to connive at prac
contrary to his duty. The records of excise proceedings afford
instances of excisemen having been bribed by manufacturers.

In other instances the exciseman does not reside upon the pre
but pays daily or occasional visits to the manufactory, and thus
absence many opportunities are afforded for adulteration; while r

dealers are but seldom troubled with the visits of the excise officers at all, so that full opportunities are afforded to them for the practice of adulteration, of which, as the records contained in this work show, they are not slow to avail themselves. Moreover, the efforts of the exciseman are usually directed to the discovery of the adulterating ingredients in the mass, in the raw state, if we may so term it, and not in the manufactured and adulterated article.

In some cases this method of proceeding is no doubt productive of useful results, but in too many instances it fails; moreover, it must be remembered that it is one which is enormously costly. While it might be advisable to retain in some cases the services of excise inspectors or officers, the number employed might doubtless be much reduced, and thus a great saving would be effected, and the work at the same time less objectionably and much more efficiently and scientifically performed.

We reserve for the present the details by which these very desirable results might be secured, and will now confine ourselves to the remark that the methods at present adopted by the Excise for detecting adulterations are unworthy of the scientific character of the times in which we live. We believe, however, that the importance of a more full application of science to the question of adulteration has begun to be considered by the Excise authorities, and that some studentships have been instituted for the instruction of young men in those sciences, the knowledge of which is absolutely necessary to qualify them for the duties of excise examiners.

We have now shown that the State is deeply concerned in a pecuniary respect in the question of the adulteration of exciseable articles of consumption.

The next point for consideration is the sanitary aspect of the subject. Sufficient evidence will be found in the present work to show that this is not an unimportant branch of the question. The following more or less injurious, deleterious, or poisonous substances have been detected in the several articles already reported upon: thus in—

Coffee - - -	Chicory, Roasted Corn and Beans, Carrots, Acorn, &c., injurious indirectly by depriving the consumer of so much Coffee, with the valuable properties of which the substituted articles have nothing in common.
Cocoa - - -	Inferior Starches, Coarse Sugar, and Ferruginous Earths, as Venetian Red and Ochre.
Cayenne Pepper and Curry Powder.	Red Lead, Vermilion or Bisulphuret of Mercury, and Venetian Red.
Coloured Confectionery.	Red Lead, Vermilion, Gamboge, Chrome Yellow or Chromate of Lead, Prussian Blue, Verditer or Carbonate of Copper, Emerald Green or Arsenite of Copper, the three Brunswick Greens, various Oxides of Iron, White Lead or Carbonate of Lead.
Custard Powders -	Chrome Yellow.
Gin - - - -	Cayenne.
Pickles, Preserves, and Bottle Fruits and Vegetables.	Certain Salts of Copper, chiefly the Acetate.
Potted Meats and Fish, Anchovies and Sauces.	Iron Earths, as Venetian Red and Bole Armenian.

PORTER AND STOUT	Cocculus Indicus and Sulphate of Iron.
SNUFF	Bichromate of Potash, Chrome Yellow, Red Lead, Ferruginous Earths, as Umber, Red and Yellow Ochre.
TEA	Indigo, Prussian Blue, Chinese Yellow, Black Lead, Catechu, Sulphate of Iron, Foreign Leaves, Sand, &c.
VINEGAR	Sulphuric Acid, Pyroligneous Acid.

The above list includes not only many articles which are more or less injurious and deleterious, but likewise some of the deadliest and most virulent of known poisons, as the following:—the chromates of potash and lead, carbonate of lead, red oxide of lead, bisulphuret of mercury or vermilion, the three Brunswick greens, which are composed of Prussian blue and chrome yellow, the carbonate, acetate, and arsenite of copper.

Some might be supposed to allege that the quantities used are too inconsiderable to be productive of injury to health; this is assuredly not so, however, as is proved by actual observation and experience. Some of the articles above named, as the several preparations of lead, copper, mercury, and arsenic, are what are called cumulative,—that is, they collect and accumulate in the system,—so that, no matter how small the quantity of them introduced at one time or in a single dose, the system, or particular parts of it, are at length brought under their influence, and certain diseases are induced, characteristic of poisoning by lead, copper, mercury, or arsenic.

Of this fact very striking evidence is afforded in the cases of lead-poisoning reported in the article on Snuff and its Adulterations, and which were occasioned by the use of snuff adulterated with lead.

But the quantity of these poisonous substances taken at one time is often by no means inconsiderable, but sufficient in some instances indeed to be at once productive of serious, and occasionally even fatal, effects. Scarcely a year passes by but several cases are recorded of poisoning by articles of coloured confectionery; the particulars of a few of such cases will be found in the Report on Poisonous coloured Sugar Confectionery.

No doubt, in many cases, the effects produced by the daily introduction, in minute quantities, of certain powerful or poisonous substances are slow and insidious, and their action not easily traced out; but yet, that the ultimate effects of these on the system are very great, cannot for a moment be doubted. Thus, it is impossible to conceive but that the introduction of Picrotoxine into the stomach, through the beer consumed, or of copper through the pickles and bottled fruits used; or of cayenne through the gin and rum drank, must be productive of injurious consequences. The effects of alcohol, when taken in large quantities or for a long period, are in themselves sufficiently injurious; but, by the addition of cayenne to this, it forms a combination the action of which no human stomach can long resist. These examples are cited merely as illustrations: their number might be greatly increased.

But sufficient has now been advanced to show that the subject of the Adulteration of the Solids and Fluids consumed as articles of food is one intimately associated with the Public Health. Were we to extend our inquiries to Drugs and Pharmaceutical Preparations, the immense importance of the question would become still more strikingly manifest. Nearly all the most useful and important articles of the Materia Medica are grossly and systematically adulterated, often to an enormous extent, so that it is impossible to estimate the strength of the different remedies administered, or the extent and character of the effects produced. The greatest confusion and uncertainty are thus introduced into the practice of medicine, and, no doubt, many valuable lives annually sacrificed. For confirmation of this statement, see the Reports of the Analytical Sanitary Commission contained in "THE LANCET" for 1853 and 1854, on the Adulteration of Jalap, Scammony, Opium, &c.

The third and last aspect in which adulteration has to be considered is the Moral.

It is impossible for a man to be guilty of adulteration, and yet be an honest and a moral man, although doubtless there are many adulterators who flatter themselves with the belief that they are so; it is, however, but an attempt at self-deception, as they themselves could scarcely fail to admit, were they fully and deliberately to consider the subject of adulteration in all its bearings.

Can it be said that the man, be he a manufacturer, or a roaster and grinder of chicory and coffee, or be he a retail tradesman, who adulterates the goods which he sells, and mixes with them roasted corn or beans, Venetian red, or red lead, &c., is guilty of a less offence than the man who appropriates that which is not his own? Really and morally, the former is the greatest offender, notwithstanding that the law, through defect, appears to make a distinction in his favour, although it regards both as guilty. Thus, while the adulterator, when the offence is brought home to him, which, through supineness, is very rarely the case, is punished by a mere pecuniary fine, the thief, if he steal only the value of a penny piece, is committed to prison, and has often to expiate his offence on the wheel of the tread-mill. Although such is the present defective state of the law in this respect, it surely cannot long be permitted to remain in this condition.

But adulteration makes not only those who practise it dishonest, but other very serious evils ensue. Thus, it begets the greatest mistrust on the part of the buyer, who loses confidence in those with whom he deals, and in this way sometimes the honest trader comes to be looked upon with the same suspicion as the adulterating merchant, manufacturer, or tradesman. Another consequence is, that the status of that portion of the trading community which sells articles of consumption is lowered, and is looked upon with misgiving in all its transactions. Lastly, the character of the whole nation suffers in consequence of the prevalence of adulteration. The character of this country has certainly suffered, to some extent, in consequence of the disclosures contained in the Reports embodied in this work. In proof of this statement, we have only to refer to those foreign journals, principally German and French, in which the Reports of the Analytical Sanitary Commission are noticed, and nearly all the Reports were thus noticed from time to time as they appeared. These notices were not unfrequently accompan with remarks anything but flattering to our integrity. One notice, remember, alluding particularly to our being a nation of shopkeepers, served that we appeared to have strong claims for being regarded as nation of rogues.

The moral effects of adulteration are, then:—That it makes men di honest, distrustful of each other in their dealings, and that it lowers t commercial character of the nation.

Thus we have shown that there is not a single individual whose interes are not deeply concerned in the subject of adulteration. The interests bodies and associations of men, who have the provisioning of large numbe are of course still greater. Thus the subject of adulteration vitally affe our hospitals and other charitable institutions, workhouses, barrac depôts, shipping, lunatic asylums, public schools, and similar institutio These are usually supplied by contract with the different articles of co sumption, as tea, sugar, coffee, cocoa, arrow-root, oatmeal, spices, &c. No as we have shown in some of the Reports contained in this work, t articles supplied under these contracts are more subject to adulterati than any others.

It is to be regretted that the heads of the different institutions ab alluded to, especially Boards of Guardians, do not adopt some means which the quality and condition of the several articles of consumpti supplied to them may be ascertained. It is true that by adulterati those Boards are often enabled to accept contracts *under market pri* and as paupers only have to be fed, they seldom trouble themselves mu about the purity of the articles supplied. We could cite instances in whi this practice has been adopted; for one case the reader is referred to t Report on Arrow-root. A memorable instance of the ill effects resulti from adulteration is afforded by the Tooting case. It will be rememb that some four or five years since a great many deaths occurred in Droui establishment for pauper children at Tooting, and an inquiry, over whi Mr. Wakley the coroner presided, was instituted, as to the cause of de It came out, on the investigation, that the oatmeal, which formed so co siderable a portion of the diet of the children, was largely adulterated wi barley-meal, which differs from oatmeal in its being less nutritious, and its aperient properties; diarrhœa and wasting were prominent symptoms the cases of the unfortunate children.

It cannot be doubted but that much benefit has resulted to the publ from the Reports on Food and its Adulterations embodied in this work. the correctness of this statement much convincing evidence could be adduc We will not dwell, however, upon this part of the subject, but will simpl remark, that much of the good which has been effected has been due to th manner in which the several Reports as they appeared were taken up the Press, the chief facts contained in them being thus at once extensive communicated to the public.

Before concluding this Introduction, we would advert to the circumstances under which the Analytical Sanitary Commission took its origin.

In 1850, the author of this work first came to reside in London. Many months had not elapsed before he perceived that there was something very wrong in the state of most of the articles of consumption commonly sold, and he was particularly struck with the condition of the ground coffee as ordinarily met with. This led him to make some examinations, principally microscopical, of different samples of this article. The results of these examinations were embodied in a paper which was communicated to the Botanical Society of London. The subject attracted considerable attention, and notices of the paper read were promptly inserted in nearly all the daily and weekly newspapers, including the "Times." The author next turned his attention to Sugar, and prepared a paper, which he likewise intended to submit to the above-named society; he also resolved in his own mind to follow up the subject of the Adulteration of Food, perceiving its important nature. In the meantime, after the publication of the paper on Coffee, and before the reading of that on Sugar, Mr. Wakley communicated with the author, stated his conviction that the exposure of adulteration would fail to produce any beneficial effects, unless it was accompanied by the publication of the names and addresses of all parties of whom the articles examined were purchased, and this whether they were found to be genuine or adulterated; and he asked, whether it was possible that the inquiries could be so conducted as to admit of the publication of the names and addresses of the manufacturers and tradesmen of whom the articles were procured, and whether the writer was prepared to undertake a series of investigations on the subject of adulteration. After a little consideration, the reply was in the affirmative. On this, Mr. Wakley determined, after having given due warning and notice, to publish the names and addresses of all parties which the author might furnish to him, and Mr. Wakley further devised the Title under which these Reports have from time to time appeared.

For a period of nearly four years, the Reports in question have now been published with considerable regularity, and during that time the names and addresses of hundreds of manufacturers and tradesmen have been made known, and much good in a variety of ways has resulted. The consumer, the revenue, and the honest trader have all been greatly benefited.

It is quite impossible to speak in too high terms of the great moral courage evinced by Mr. Wakley in his determination to publish in all cases the results of the investigations, and to give to the world the names and addresses of all persons concerned. The responsibility incurred was immense; and had the confidence reposed not been justified, and had not the greatest thought and caution been exercised, most disastrous would have been the consequences. Great, therefore, is the debt of the public to Mr. Wakley in this matter. The author fully believes that there is not another editor to be found who would have ventured upon so bold and so unprecedented a step. Lastly, the author desires it should be known, that in conducting these inquiries he possessed the greatest possible freedom of action; that Mr. Wakley never interfered with him in the slightest manner; that no suggestions were at any time made as to the neighbourhoods in which the purchases should be made; and that in no single instance since the inquiries began did Mr. Wakley suggest that any one name should be either added to, or omitted from, the lists that were published. Thus friends and foes were in all instances similarly treated. In fact, nothing could be more strictly impartial and disinterested than the conduct of Mr. Wakley throughout in reference to the publication of these Reports.

One feature which distinguishes the Reports contained in this work from all other articles treating on the same subject is their strictly *bonâ fide* character, the conclusions and facts contained in them being all deduced from actual observation and experiment. The statements of writers so often handed down from author to author were in no cases accepted, unless confirmed by personal research.

Another feature which characterises these investigations is, that in them, for the first time, the powers of the microscope were regularly and systematically applied to the elucidation of the subject of adulteration, and this with an amount of success not originally hoped for, and which is truly surprising.

The earliest and most successful application of the microscope was to the adulteration of coffee. Contrary to what many would have anticipated, and contrary to the opinions and statements of three of the most eminent chemists of the day, as cited in the House of Commons by a late Chancellor of the Exchequer, who affirmed that neither by chemistry nor by any other means could the admixture of chicory with coffee be detected, the author succeeded in discovering, in the most certain and demonstrative manner, the presence of chicory and a variety of other vegetable substances in adulterated ground coffee.

We may be pardoned also for alluding to the many points of scientific interest which have been elucidated by our researches. The component elements and ultimate structure of a vast variety of vegetable substances are illustrated in the following pages, in such a manner as to constitute no unimportant contribution to vegetable anatomy and physiology.

We will now consider the means by which adulteration may be checked, to a very great extent, if not entirely prevented. These means should be so devised as to embrace the whole question of adulteration, and should not be confined to those articles upon which a duty is levied, but should embrace all articles of food and drink, as well as drugs and pharmaceutical preparations.

The means to be employed are twofold, — the first includes those measures which are requisite for the *discovery* of adulteration, and the second embraces all those means necessary for *prevention*.

For the discovery of adulteration, it is requisite—

That there should be a Central Board or Commission, upon which there should be a sufficient number of scientific analysts, microscopical and chemical. Under the direction of this Board, purchases of articles should be made from time to time, analyses of them instituted, and Reports published.

That examining inspectors should be appointed at all the more considerable import and export towns, to prohibit either the importation or exportation of adulterated articles of consumption of all kinds, including drugs.

That these inspectors should be empowered to make purchases in the different towns to which they are appointed, and that they should forward all articles which are suspected to be adulterated to the Central Board for examination.

That district examining inspectors should be appointed, having their residence in all the large inland towns; that the duty of these should be to keep a close watch upon all suspected articles, to make purchases of samples, and to forward them to the Central Board.

For the prevention of adulteration, the following are the measures which appear requisite: —

That adulteration, when brought home to the party practising it, should be punishable both by fine and imprisonment.

That the seller of any adulterated article should be punishable by the infliction of fines, and this, in most cases, under the summary jurisdiction of a magistrate.

That the actual adulterator should be punishable by fine or imprisonment, or by both.

That a system of publication of the names and addresses of all persons whose goods have been analysed should be adopted, and this whether the articles on examination have proved to be genuine or adulterated.

Further, it might be well, for the still more effectual discovery and prevention of adulteration, to invite the public to forward under seal to the Central Board samples of articles of consumption in their possession suspected to be adulterated.

The above is merely a short sketch or outline of the measures required for the discovery and prevention of adulteration.

It should be recollected that at the present time there is a most extensive and costly machinery at work for the prevention of the adulteration of all exciseable articles, the Excise, but this object it has hitherto failed to accomplish; so that nearly all that would be requisite for carrying out these suggestions would be to re-model the detective and analytical or scientific department of the Excise, and to enlarge the sphere of its operation. Thus no objection exists against the scheme here propounded on the score of expense. There is no question but that while a considerable saving of expense would ensue to the consumer, the revenue would likewise be benefited, and the public health protected; and all this would be accomplished at a less cost to the state than is now entailed by the machinery referred to, which so completely fails to effect the principal purpose for which it was instituted, viz., the prevention of the adulteration of all duty-paying articles. We lately had an opportunity of offering suggestions for the most part similar to the above, in evidence given before a recent Committee of the House of Commons on Public-houses.

Another, and perhaps a more simple method of dealing with the question of adulteration in the first instance, would be to establish a Commission or Board in connection with the General Board of Health. Such a Commission, actively carried out, although it might not wholly suppress adulteration, would certainly do so to a considerable extent, and through it all those adulterations which are detrimental to health might be speedily and effectually prevented. It would also possess certain other advantages; the machinery would be simple, inexpensive, and it would not interfere with any existing arrangements.

We have now to acknowledge the great assistance which we have derived at different times from our friend Dr. Letheby, to whom we have been in the habit of referring frequently on doubtful points. The chemical portion of the later Reports contained in this volume, commencing with that on Vinegar and its Adulterations, have all been revised by Dr. Letheby. Our best thanks are, therefore, due, and most cheerfully accorded, to that gentleman for the kind and ready aid which he has at all times afforded us.

We have to express our acknowledgements to Mr. Joseph Hume, and Mr. A. W. Fonblanque, of the Board of Trade, for certain statistical information most kindly and readily afforded.

Lastly, we are indebted to Mr. J. C. Kent, of Upton-upon-Severn, for much similar information.

Although this work abounds with facts relating to Adulteration, it yet does not afford by any means a complete exposure of the subject. Numerous adulterations, with many of which we are already acquainted, remain to be described; these will be treated of in the Reports of the Analytical Sanitary Commission on Food and its Adulterations, which yet remain to be published. In the meantime, it is hoped that the publication of these Reports in their present form will hasten the adoption of those preventive measures which are so urgently required. The public are now fully alive to the importance of the subject; the medical profession is equally so; meetings are being held, as at Birmingham and Wolverhampton, to urge upon the Legislature the necessity of adopting some steps to counteract the pernicious effects of adulteration; the President of the General Board of Health has proclaimed his intention of dealing with the subject; lastly, the Select Committee on Public Houses have embodied in their Report to the House of Commons, a distinct recommendation to the effect that the whole question of Food, Drink, and Drugs, from its great importance, demanded that an early Parliamentary inquiry should take place. This recommendation was thus expressed:—"The matter of adulteration and dilution is, however, sufficiently important to form the subject of a distinct inquiry; and your Committee are of opinion that, as early as may be convenient, an inquiry should take place into the whole question of the adulteration of food, drink, and medicines. The suppression of adulteration is of the utmost importance, not to the consumer only, but in checking the dishonest competition so recklessly carried on, to the ruin of fair trade." We have thus, then, good reason to hope that the days are drawing to a close when practices so disgraceful and so dishonest as those revealed in this work will no longer be tolerated.

The Glass and other Chemical Apparatus and Instruments required for the Detection of Adulteration may be procured of the parties mentioned below.

The chemical glass apparatus required for conducting the inquiries and investigations contained in this work, may be procured of either Mr. J. Griffin, 10. Finsbury-square; Messrs. Jackson & Townson, 89. Bishopsgate-street Within; Mr. Button, Holborn Bars; and Mr. G. Simpson, 1. Kennington-road.

The chemical instruments, and other apparatus necessary, may all be obtained of Messrs. Horne, Thornwaite, & Co., Newgate-street. In particular, they have undertaken to supply a very excellent microscope well adapted for the detection of adulteration, for 6*l.* 6*s.* This instrument will be furnished with two object-glasses, one magnifying 100 diameters, and the other 350 diameters.

A somewhat similar microscope, on terms equally reasonable, may be obtained of Mr. Pellischer, Optician, of New Bond-street.

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FOOD

AND

ITS ADULTERATIONS.

INTRODUCTORY REMARKS.

CONTAMINATED air and pure water are now universally regarded as necessary the maintenance of a healthy existence, and to obtain them we have appointed oards of Health" and "Commissions of Sewers." That unadulterated Food, bone and muscle of the body, is not less requisite, will be readily allowed; it will appear, on reflection, as somewhat remarkable, that the interests of public in these important particulars should not hitherto have been watched r and protected by any authorised body or commission.

hat the various articles of consumption differ greatly in quality, and are ject to numerous adulterations, must be evident to all, from the slightest sideration and examination of the subject; and if any general proof were uired to establish the truth of this position, it would be found in the low and emunerative prices at which very many commodities, to be genuine, are now mmonly sold. That, therefore, there is much relating to our food and drink uiring exposure and remedy cannot be doubted.

e propose, then, for the public benefit, to institute an extensive, and some-t rigorous, series of investigations into the present condition of the various icles of diet supplied to the inhabitants of this great metropolis and its inity, and it is probable that hereafter the inquiries will be extended to e of our distant cities and towns.

ne especial feature of these inquiries will be, that they are all based upon ally observation and experiment: the microscope and test-tube throughout e investigations will be our constant companions. We shall borrow but e from the writings of others, preferring to labour and think for ourselves, to work out our own conclusions in an independent manner.

second feature will consist in the introduction of faithful engravings, illus-ing all the more important particulars relating to the structure of each article termined by the microscope.

third and highly important feature will be the *publication* of the *names* and *resses* of the parties from whom the different articles, the analyses of which be detailed, were purchased: the advantages of such a course of proceeding ire little explanation.

xperience has shown, that any merely general exposure of the nature of the lterations practised on the public through their food is not sufficient to deter a repetition of them, and that the only way in which it can be hoped that h fraudulent practices can be stayed, and the public protected, is by such eedings as will entail personal discredit and probable loss.

w, although we are fully and firmly determined to protect the interests of the public, we, at the same time, do not desire to inflict injury on any one, proof of which we shall refrain from giving any names of adulterators for space of three months from this date, and shall at present, in connexion with analyses, merely indicate the street or place in which each vitiated commod subjected to examination was purchased.

Notwithstanding that we should be perfectly justified in at once making kno the name of the tradesman or merchant who is dishonest enough to adulter the article which he vends, and although to such a proceeding he could raise sufficient objection, nor hope for the sympathy of the public, yet, desiring avoid all appearance of harshness, we shall refrain, as we have stated, from doi so at present, but give him the benefit of this distinct warning.

That the public at large will be greatly benefited by these inquiries is obvio and that such of our colonists as import any article of food into this country the revenue itself will be largely the gainers, might be very easily and sat factorily proved.

The honest tradesman or merchant will also be benefited; he has nothing fear, but, on the contrary, much to gain, for while he will be able to secure prices for a genuine commodity, his name, also, will be made known to public, and he will be upheld in his true light and character, as an upright honourable tradesman.

Who, then, need fear the disclosures it will be our duty to make? Fradul dealers,—whether they be wholesale merchants, knavish manufacturers, adulterating retailers,—they alone will have cause to fear, but none whate rightfully or legally to complain of the consequences of their own unprincip proceedings.

The urchin who filches a bun, a penny-piece, or the value of one, breaks law, and is liable to punishment, even imprisonment,—is it to be supposed, the fore, that the cunning and systematic adulterator of our food and drink, robs us, not only of our money, but sometimes even of our health and streng is less guilty? that he is to be allowed to violate the law with impunity in daily dealings, and not only to go unpunished, but to carry about with him, at present he commonly does, in his intercourse with his fellows, the undese reputation of an honest man? That the law, while it rigorously punishes trivial offender, should allow the greater criminal to go at large unscathed, insult to common sense.

But the question is not merely one of honesty and dishonesty, of profit loss, it is also eminently sanitary, one of health, and even, in some cas life itself—of which many proofs might be readily adduced.

Thus the physician, having carefully planned the diet of his patient, too finds his well-grounded hopes frustrated through the nefarious practi adulteration.

In one case he orders arrow-root and isinglass,—the first is very comm adulterated with potato, or some other inferior farina, whilst for the sec substituted some ill-prepared form of gelatine. In another case he pres strong coffee or tea, it may be to counteract the effect of some narcotic poi the one is adulterated with a large quantity of chicory, and the other con exhausted tea-leaves re-dried.

Similar and even more striking examples affecting strength, health, sometimes life, might be multiplied to almost any extent; but these few vations are sufficient to show the vast interests involved in the considerati the subject of the adulteration of the food and drink consumed by the publ

In treating the several subjects which will come under our notice, we do intend to confine ourselves to any very strict order of arrangement, but probably, from time to time, turn aside from our regular course to take consideration such subjects as may happen to be possessed of peculiar or te rary public or professional interest.

COFFEE, AND ITS ADULTERATIONS.

ᴀᴛ the adulteration of coffee prevails to a great extent may be inferred, not ely from the variations frequently to be observed in the outward characters lifferent samples of this article, but also from several considerations of a eral nature. Thus—

st. While the consumption of all other articles, during the past few years, progressively increased with the increase of the population, coffee, during t period, has remained comparatively stationary, although, as is well known, use of an article, under the name of coffee, is now much greater than for- rly, especially amongst the members of the different temperance and total stinence societies.

2nd. It has been ascertained that a much larger quantity of a substance called ffee is annually sold than passes through the custom-houses.

3rd. Chicory is cultivated in large quantities in various parts of this country; d it has been even rumoured that a *minister of the Crown* is himself a large ower of this plant; now, as little chicory is *retailed* to the public under its own me, the inference is, that it is employed, and annually consumed, in the adul- ration of coffee.

But it is very far from necessary that in making out our case we should rely on general statements and arguments; scientific evidence of the most con- usive character has been obtained, by which the nature of the adulterations of ffee, and the extent to which they prevail, may be ascertained.

Now, the chief articles, although many others are occasionally employed, with hich coffee is adulterated are, chicory, different kinds of corn, as wheat, rye, d barley, potato, and beans. It is necessary that these substances, like the coffee- rry itself, should be roasted—that is, that they should be partially charred, d so far reduced to the condition of charcoal, or carbon.

In vegetable charcoal, as is well known, the component parts of the several sues may yet be distinguished, without any great difficulty, by means of the croscope. The less completely carbonised structures of the coffee-berry, cory-root, and other organic substances employed in the adulteration of fee, may likewise be detected, with still greater facility, by the same means. s fact, as will presently be seen, has been fully proved by the results obtained.

The vegetable productions with which coffee is adulterated differ very con- rably from each other; hence it might be concluded that each would present l-marked structural differences; and this is really the case: the structure of coffee-berry is very different from that of the chicory-root, and both differ as h from corn, beans, or potato, as these do from each other.

Ve will now describe sufficient of the structure of each of these substances as be necessary to enable us to detect the adulteration of coffee with any one nore of the above substances.

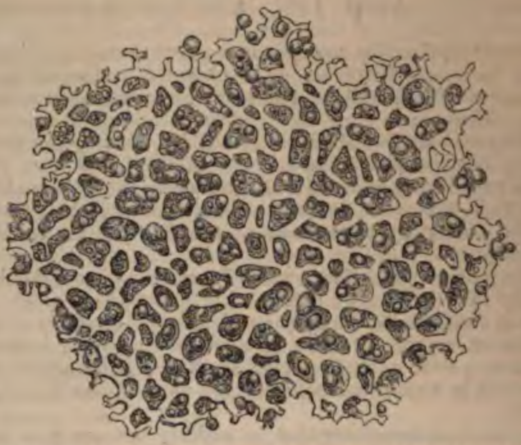
tructure of the Coffee-Berry.—Two parts are to be discriminated in the e-berry—the substance of the berry, and the testa, or investment by which surrounded.

he *berry*, previous to roasting, and even after it has been soaked for a long in water, is hard and tough, in which respect it differs from all those tances which enter into the adulteration of coffee, and which become softened mmersion in cold water; the hardness is even retained subsequently to the ting, and is so great, that by this character alone the fragments of the nd and roasted coffee-berry may be readily distinguished from those ot ory.

consists of an assemblage of vesicles or cells of an *angular* form, which ad- so firmly together that they break up into pieces rather than separate into nct and perfect cells. The cavities of the cells include, in the form of little s, a considerable quantity of aromatic volatile oil, on the presence of which ragrance and many of the active principles of the berry mainly depend. *Fig.* 1.

he *testa*, or investing membrane, presents a structure very distinct from that e substance of the berry itself, and when once seen it cannot be confounded any other tissue which has yet been observed entering into the adulteration offee: it is made up principally of elongated and adherent cells, forming a

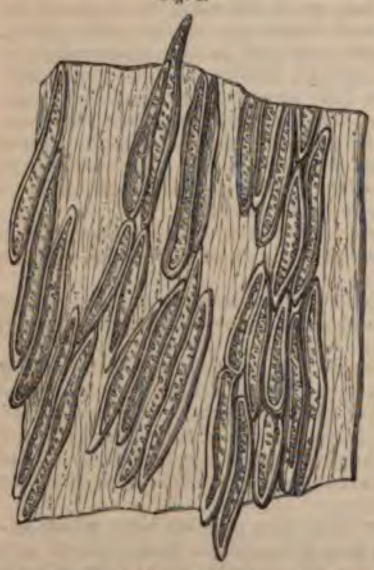
Fig. 1.



Section of UNROASTED COFFEE-BERRY, showing the size and form of the cells, as well as the drops of oil contained within their cavities. Drawn with the Camera Lucida, and magnified 140 diameters.

single layer, and having oblique markings upon their surfaces; these cells rest upon another thin membrane which presents an indistinct fibrous structure. Between the berry and its covering some essential oil is generally present. *Fig.* 2.

Fig. 2.



A portion of the INVESTING MEMBRANE of the coffee-berry, showing its structure. Drawn with the Camera Lucida, and magnified 140 diameters.

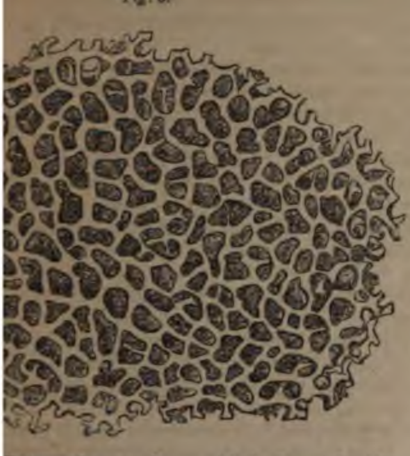
The quantity of this membrane present in a broken and divided state in any sample affords, therefore, some clue to the amount of coffee contained in it.

It has been proposed to deprive the berry of this membrane, and a patent has actually been taken out for this purpose—a process of somewhat doubtful utility, because the removal of this tissue cannot be effected without the loss of the greater part of the essential oil lying between it and the berry, and usually adherent to the former. In the act of roasting, however, more or less of this membrane becomes separated from the berry, when it is termed by the roasters "flights."

In the groove which runs along each berry, a few small vessels, each formed of a single and continuous spiral thread, are usually to be met with; it is impossible, however, to confound these with the ducts hereafter to be described, and which occur in certain other vegetable tissues.

Now the roasting of the berry does not alter its structure; the tissues are indeed partially charred, but they still preserve their chief characteristics. The essential oil, however, is no longer visible in the cells in the form of minute drops or spherules. This has, in part, been dissipated by the heat employed in the process of roasting, and in part is more generally diffused throughout the *cavities* of the cells; that it is not entirely dissipated and destroyed is evident

Fig. 3.



ROASTED COFFEE. Drawn with the Camera Lucida, and magnified 140 diameters.

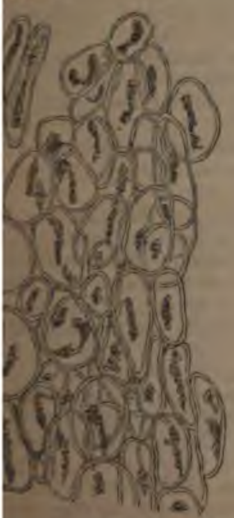
from the fact, that in ground roasted coffee, diffused in a little water, the oil may be readily detected in considerable quantity in a partially fused state, in little masses of irregular size and form. *Fig.* 3.

Structure of Chicory Root.—Chicory is the root of the *Cichorium Intybus*, a plant belonging to the natural order *Cichoraceæ*, which includes the Dandelion; and, as might be supposed, from the very dissimilar characters of roots and seeds, it differs very greatly in structure from the coffee-berry.

In it also two parts require to be discriminated,
sels. The chief bulk of the root is made up of little utricles or
re generally of an *elongated* form, but sometimes *rounded*, and which,
lls of the coffee-berry, separate from each other with great readiness,
ppearances which, when once observed, cannot be mistaken. *Fig.* 4.
o not, like those of coffee, contain globules of essential oil, a fact of
ance.

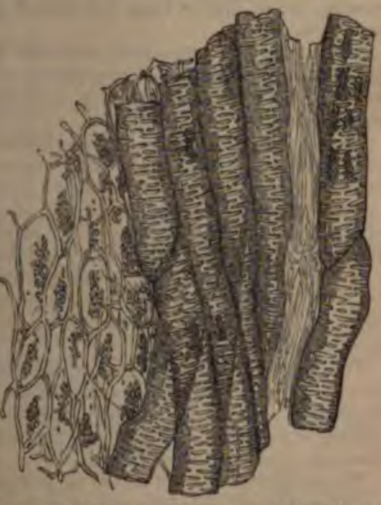
hrough the centre of the root, in a longitudinal direction, are
ssels varying greatly in size, but all of the dotted or interrupted
Now there is nothing analogous to these beautiful structures in the
or in the majority of the substances ordinarily employed in the
of that article. *Fig.* 5.

Fig. 4.



STED CHICORY-ROOT, taken from
lterated coffee, showing the cells
ncipally constituted. Drawn with
cida, and magnified 140 diameters.

Fig. 5.



Fragment of ROASTED CHICORY-ROOT, taken from a sample of adulterated coffee, showing the dotted or interrupted spiral vessels, which pass in bundles through the central parts of the root. Drawn with the Camera Lucida, and magnified 140 diameters.

Chicory, owing to the absence of essential oil, unlike coffee, readily imbibes water, and when immersed in that fluid it quickly becomes soft, in which respect also it differs from the roasted coffee-berry.

Structure of the Farina of the Gramineæ.—Each grain of the different species of corn, deprived of its investing tunics, or husks, consists of a network of cells, the substance of which has been denominated cellulose, and in each of which a variable number of starch granules is included.

Now these starch granules differ in character in different plants, and this frequently, even in species belonging to the same natural family, so that by their means it is often easy to name the particular species to which any given granule belongs. In the majority of the corn tribe, the granules are flattened and rounded discs, of moderate size, obscurely marked with concentric lines or rings; the starch granules of many species also possess other perfectly distinctive markings, and characters, of which, in this place, it is not necessary to give a detailed description, as in a future report the starch of wheat, rye, oats, &c. will be fully described and accurately represented.

Structure of the Farina of the Leguminosæ.—The different species of beans and peas, deprived of the seed-covering, possess a structure analogous to the grain of corn decorticated, that is, each pea or bean consists of a reticulation of cells, the cavities of which are occupied with numerous starch granules.

The cells differ, however, from those of the seeds of the Gramineæ in their stronger and stouter character, and particularly in the thickness of their parieties.

The granules in the pea, bean, and many other species of this tribe, are large, oval, sometimes reniform, and the central cavity is usually of an elongated shape, presenting the appearance of a furrow under the microscope. These also will be figured and further described at a future stage.

Structure of the Farina of the Potato.—Pure potato flour is seldom used in the adulteration of coffee, it being too expensive, and otherwise not well adapted for the purpose; it is usually the whole potato which is employed, and which is probably first boiled, and then roasted.

The general structure of the potato resembles, to some extent, that of the corn, pea, and bean, already cursorily described. In the unboiled state, the cells form a coherent reticulation, but after boiling, they readily separate from each other, and thus show that each is really a distinct and independent structure.

These cells after boiling present a somewhat fibrous appearance, and are, of course, much larger than the starch granules, many of which are contained in each cell.

The granules themselves, as seen in pure potato flour, are large, ovate, and beautifully marked with concentric rings; but in the boiled potato, they lose much of their form and beauty, and become, for the most part, misshapen and collapsed.

Coffee Colourer.—But the list of articles employed in the adulteration of coffee does not terminate with those above enumerated; at least one other remains to be noticed.

The uninitiated in the mysteries of coffee imagine that the deep-brown colour of the beverage made from that substance is peculiar to coffee, and that the richness and depth of the colour indicate the strength and purity of the article.

Now this brown colour is not peculiar to, or indicative of, coffee; it results from the burning, or partial charring, of the berry; and most other roasted vegetable substances, as chicory, corn, &c., yield, on infusion or decoction, a similar colour.

When cold water is poured upon coffee, the liquid acquires colour only very slowly and gradually; the colouration is never very deep, even after prolonged maceration, and the transparency of the water is scarcely at all affected: when boiling water even is employed, the infusion, although somewhat deeper, still remains clear and transparent.

When, however, cold water is poured upon ground chicory-root, the liquid becomes almost immediately of a deep brown, and in a very short time the depth of colour is so great, and the loss of transparency such, that the fluid is rendered opaque: with water at the temperature of 212° Fah., the results are of course much more marked.

The very different effects of the action of water on ground coffee and chicory, afford, then, one useful and practical means of discriminating between genuine coffee and that adulterated with chicory.

The natural colour thus produced does not, however, satisfy the trade, and a material is very extensively employed to heighten the tint, and thus to hide the nature of the adulterations practised: this is called "the coffee-colourer."

This substance is sold in tin canisters; its use is generally attended with secrecy, but it is sometimes vended openly, not as a coffee-colourer, but as a "coffee-refiner"—a phraseology indicative simply of a refinement of deception.

The specimens of this article which we have examined have consisted of burnt sugar, the great colouring properties of which are well known.

The rapid colouration of water, although calculated to excite suspicion, does not afford, therefore, certain proof of adulteration by chicory, as it may be occasioned likewise by the coffee-colourer just noticed.

We have been informed that sugar is sometimes added to the coffee-berries while undergoing the process of roasting, and being thus burned, becomes converted into a coffee-colourer. The coffee-colourer is much used by the retail dealer, but principally by the owners of coffee-shops, who employ it to cover and conceal the poverty and nauseous character of the filthy and abominable compound which many of them vend, at a penny and a penny-halfpenny per cup, under the much-abused name of coffee.

Extent to which Coffee is adulterated.—We will now proceed to ascertain, by the examination of different samples of coffee, the extent to which the adulteration of that article prevails. The results of the analyses exhibited in the next table are entirely distinct from those given in the table that succeeds it, and the analyses themselves were made several months previously.

RESULTS OF THE MICROSCOPICAL EXAMINATION OF THIRTY-FOUR DIFFERENT COFFEES OF ALL QUALITIES AND PRICES, AND SOLD UNDER THE FOLLOWING ATTRACTIVE TITLES:

Coffees of High Price.

1. *Finest Mocha Coffee.* No adulteration.
2. *Noted Old Mocha.* No adulteration.
3. *Finest Jamaica Coffee.* No adulteration.
4. *Rich Old Mocha.* Of chicory, a good deal.
5. *Best Old Mocha.* A little chicory.
6. *Fine Old Turkey Coffee.* Much chicory.
7. *Very Fine Mocha.* Much chicory.
8. *Genuine Old Mocha.* A little chicory.
9. *Finest Turkey Coffee.* Contains chicory.
10. *Celebrated Old Mocha.* A good deal of chicory.

Coffees of Medium Price.

11. *Costa Rica Coffee.* Nearly one half chicory.
12. *Fine Jamaica Coffee.* Contains a considerable quantity of roasted corn.
13. *Delicious Coffee.* Roasted beans and chicory, forming about one-third of the article.
14. *Plantation Coffee.* Of roasted corn, much, with some chicory, both together forming not less than a third of the sample.
15. *Finest Turkey Coffee.* Much chicory, and some roasted corn; very little coffee.
16. *Celebrated Jamaica.* Very little coffee, principally chicory.
17. *Finest Berbice Coffee.* About one-half coffee, much chicory, and some wheat.
18. *Splendid Turkey Coffee.* About one-half coffee, the rest chicory.
19. *Fine Plantation Coffee.* One-third coffee, the rest chicory, with a little roasted corn.
20. *Beautiful Jamaica Coffee.* Two-thirds coffee, the rest chicory, with a little corn.

21. *Finest Java Coffee.* Half coffee, much roasted corn, with a little chi
22. *Superior Plantation Coffee.* Three-fourths coffee, the remainder chi

Coffees of Low Price.

23. *Fine Mountain Coffee.* Four-fifths coffee, one-fifth chicory.
24. *Parisian Coffee.* Principally chicory and corn, very little coffee.
25. *Superb Coffee.* The principal part corn and chicory; very little cof
26. *Rich Drinking Coffee.* One-third coffee, the rest chicory, with
roasted corn.
27. *Very excellent Coffee.* One half coffee, the other mostly chicory.
28. *Delicious Family Coffee.* One-fourth coffee, three-fourths chicory.
29. *Fine Ceylon Coffee.* Very little coffee, a great deal of chicory, with
roasted corn.
30. *Fine Java Coffee.* Much chicory, and some roasted potato; very
coffee.
31. *Coffee as in France.* Principally chicory.
32. *Very excellent Coffee.* Principally chicory.
33. *Fine Plantation Ceylon.* Nearly all chicory; very little coffee.
34. *Delicious Drinking Coffee.* A large quantity of chicory and much roa
corn.

From an examination of this Table it appears—

1st. That of the thirty-four coffees, *thirty-one* were adulterated.
2nd. That chicory was present in *thirty-one* of the samples.
3rd. Roasted corn in *twelve*.
4th. Beans and potato flour, each in *one* sample.
5th. That in *sixteen* cases the adulteration consisted of chicory only.
6th. That in the remaining *fifteen* samples, the adulteration consisted of
cory, and either roasted corn, beans, or potatoes.
7th. That in many instances the quantity of coffee present was very sm
while in others, it formed not more than one-fifth, fourth, third,
and so on of the whole article.

From calculations which we have made, we are satisfied that the gross aggre
of the adulterations detected did not amount to less than one-third of the en
bulk of the quantity purchased. Now, on referring to the Revenue Returns,
find that the sum derived from the duty on coffee for 1849, was 709,632*l.* 3*s.*
an amount which we have no hesitation in saying might be increased, by vigil
in the detection of the adulteration of this important article, and by punishm
of the fraud, when dectected, to very nearly 1,000,000*l.*

We observe that for 1850 the duty amounted to only 642,519*l.* 10*s.* 9*d.*, sh
ing a falling off, in spite of increase of population, of upwards of 67,000
compared with 1849, and which deficiency is doubtless mainly due to incre
adulteration.

The Adulteration of Coffee, considered Dietetically and Medicinally.—
coffee-berry is a seed, and, like seeds in general, it contains the active princi
in large proportion, of the plant from which it is procured, and especially
essential oils.

The beverages most extensively employed amongst mankind nearly all
the world are prepared from tea and coffee; to the use of these different na
have been directed by gradually acquired and long experience of the refres
and beneficial properties possessed by these infusions.

Now the active principles of tea and coffee are "theine" and "caffeine,
highly nitrogenised substances, possessed of extraordinary influence on
nervous system; and, by means of chemistry, the remarkable discovery
been made that these two bodies are identical. It is thus seen how correct
been the almost universal practice of mankind in making use of tea and co
—a practice not based on science in the first instance, but resulting solely
experience.

Chicory, on the contrary, is the root of a plant. Now roots in general,
remarkable rather for nutritious properties than for any active or medi

s ; and of this we find a very sufficient explanation, in the fact of their
on from light and heat, the great agents in the elaboration of all the more
organic principles.

cells of chicory-root, unlike those of the coffee-berry, do not contain
sential oil, and the plant, moreover, is wholly destitute of the active
le of coffee,—viz., caffeine; it being described as somewhat resembling
medicinal properties, taraxacum or dandelion, being slightly tonic, but
aperient; these properties, however, are probably almost entirely de-
d by the roasting.

s therefore obvious that *chicory root is no substitute for coffee*, since it so
etely wants the peculiar fragrance, and the invaluable stimulant qualities,
t berry.

the inferiority of chicory the observer may easily convince himself by pre-
g hot infusions of chicory and coffee separately, and then carefully con-
ng their more obvious properties: the one has little or no fragrance, a
ish and mawkish taste, and is dark-coloured, thick, and glutinous; the
me of the other is rich and exhilarating, the taste agreeable, and the liquid
t and transparent.

however, the employment of chicory be deemed desirable, either by itself
combination with coffee, let it be sold openly and separately, under its own
e, and at *chicory price;* but it is an unjustifiable imposition on the public to
under the appellations Ceylon, Berbice, Costa Rica, and Mocha coffees, a
ure of which very frequently coffee constitutes the smallest portion.

he adulterations by means of roasted corn, beans, potato, and coffee-colourer,
altogether indefensible, since the only thing in common between these and
e is the colour which they yield on infusion or decoction.

ome years since, roasted corn, principally rye, was largely sold, and em-
ed to make a beverage, which, by a fiction, was dignified by the name of
e; the chief argument, independent of price, urged in favour of it, was its
osed nutritive properties.

hen it is recollected that the starch of roasted corn is nearly all reduced to
condition of charcoal, it will at once be perceived that its nutritive qualities
not be very great, and that a single mouthful of wholesome bread contains
e nourishment than a dozen cups of a beverage made from roasted corn.

lthough "roasted corn" is now no longer sold openly, yet, as we have just
, the grocer has not failed to avail himself of it for his own benefit, but to
great disadvantage of the public.

he adulteration of coffee by substances so cheap and, for the purpose to
ch they are applied, worthless as these, is a gross fraud, requiring emphatic
emnation, and, when ascertained to be practised, meriting exposure and
ishment.

ints to Coffee-Drinkers —It will not be an inappropriate conclusion to this
munication, if we offer a few brief directions on the subject of the preparation
e beverage coffee.

hus every person who desires to have good coffee should attend to the follow-
points.

xcept of tradesmen of unquestionable integrity, he should never buy ground
e, but should procure the roasted berry: in choosing this, care should be
n to notice that it be not too dark, for if so it has been too much roasted,
some of its active properties have been injured or destroyed. It should be
nd to rather a fine powder, as this, by setting free the essential oil contained
e cells, allows more readily of the action of water upon it. Immediately on
g reduced to powder, it should be placed in a tin canister. Lastly, an *infusion*,
not a *decoction*, of the berry should be made, as during the process of boil-
the active principles, and especially the delicate aroma, are in part dissipated.
ttending to these directions, not only will good coffee be obtained, but "a
y blow and great discouragement" inflicted on the adulterators of coffee.

bove all, the coffee-drinker should never buy the coffee contained in canisters;
e may be assured that it is even more adulterated than other coffee, as it is
ssary not only that the purchaser pay for the coffee, but also for the canister
f.

ANALYSES OF VARIOUS COFFEES PURCHASED AT THE ESTABLISHMENTS DIFFERENT METROPOLITAN GROCERS, TEA AND COFFEE MERCHANTS.

1st Sample.—Purchased on Ludgate-hill.
Adulterated—with much *chicory*.

2nd Sample.—Purchased on Ludgate-hill.
Adulterated—with *chicory*, which forms about one-fifth of the article.

3rd Sample.—Purchased near St. Paul's.
Adulterated—with *chicory*.

4th Sample.—Purchased near St. Paul's.
Adulterated—with *chicory*.

5th Sample.—Purchased in High Holborn.
Adulterated—with *chicory*, which forms about a third of the whole articl

6th Sample.—Purchased in High Holborn.
Adulterated—with very much *chicory*, which forms more than half the arti and causes it to cohere, or cake, into a solid mass.

7th Sample.—Purchased in New Oxford-street.
Adulterated—with *chicory*.

8th Sample.—Purchased in Oxford-street.
Adulterated—very much with *chicory*.

9th Sample.—Purchased in Tottenham-court-road.
Adulterated—with very much *chicory*, which probably forms more than the article, and which causes it to clog, or cake.

10th Sample.—Purchased in Tottenham-court-road.
Adulterated—very much with *chicory*, which forms not less than half article, and causes it to cake into a compact mass.

11th Sample.—Purchased in Tottenham-court-road.
Adulterated—with *chicory*, which constitutes more than a third of the en article.

12th Sample.—Purchased in the Edgeware-road.
Adulterated—with much *chicory*, as well as roasted corn, the two toge forming the greater part of the article.

13th Sample.—Purchased in the Edgeware-road.
Adulterated—with *chicory*, which forms not less than half the article.

14th Sample.—Purchased in the Edgeware-road.
Adulterated—with *chicory*.

15th Sample.—Purchased in Charlotte-street, Tottenham-court-road.
Adulterated—with much *chicory* and some *roasted corn*, both together form the principal part of the article.

16th Sample.—Purchased in Broad-street, Bloomsbury.
Adulterated—with much *chicory*.

17th Sample.—Purchased in Crawford-street, Edgeware-road.
Adulterated—with *chicory* and *roasted corn*.

18th Sample.—Purchased in Great James-street, Lisson-grove.
Adulterated—with much *chicory*.

19th Sample.—Purchased in Church-street, Portman-market.
Adulterated—with a large quantity of *chicory* and some *roasted corn*.

20th Sample.—Purchased in Princess-street, Soho.
Adulterated—with much *chicory*.

We now approach the conclusion of this Report. In the Introduction, it stated that the names of the adulterators of the food of the public would no published by us until after the offenders had received the benefit of an an warning. But it may be asked—What is to be done, in the meantime, respect to those tradesmen who were found to carry on an honest trade, manage their establishments with integrity? It may be remarked, that traders were called upon by accident; that they had no notice—no intima that the goods they were selling were to be subjected to any unusual or any precedented scrutiny,—still it was ascertained, that in the ordinary cours their business they were acting with integrity towards their customers. shall allege, that, under such circumstances, they are not fairly entitled to just distinction and reward which the publication of their names will inevit confer? Such an act of justice will be universally admitted to be no more t

We feel, therefore, much satisfaction in announcing, that the two
nts where *unadulterated*, excellent coffee was purchased, at reasonable
e those of

MR. J. F. BETTS,
262. Oxford-street (corner of North Audley-street);

MESSRS. KNIGHT AND SON,
83. Gracechurch-street, City.

ee purchased at these addresses was of excellent quality and high
very marked difference existing to distinguish the one from the
e price paid at the shop of Mr. Betts was *1s. 4d.* per pound; at the
essrs. Knight, *2s.* per pound. In both instances the article was
e from adulteration.

pe that there are hundreds of dealers in coffee, in this metropolis, who
entitled to respect and confidence with Mr. Betts and the Messrs.
Ve have only deeply to regret, that it has so happened, that out of
enty and thirty apparently reputable establishments, from only two
e ground coffee obtained. If it be true that the public health ought
ted from the noxious influence of sophisticated food, it must assuredly
d, with equal truth and propriety, that the honest trader should be
gainst his fraudulent competitor.

tions of Coffee, how distinguished. — To sum up, then, briefly. The
lterations of coffee described in the analyses may be distinguished by
ng characters: —

lteration with *chicory*, by the size, form, and ready separation of the
cells of the root, as well as by the presence of an abundance of spiral
he dotted form.

h *roasted corn*, by the size, form, and other characters, of the starch
f which the grains are principally composed.

h *beans*, also by the form, &c., of the constituent granules of starch.

h *potato*, by the large size, rounded form, and ready separation of the
cellulose, as well as by the fibrous markings on their surfaces.

the adulteration with *burnt sugar*, by the flavour and by the tests
grape-sugar.

ation to the above particulars, the principal adulterations to which
ble may be detected with facility and certainty. Other means, how-
he discovery of certain of them, have been pointed out; these we shall
ler.

has been stated, that if coffee containing chicory be shaken up with
in a wineglass, it will float, while the chicory will sink to the bottom,
n a repetition of the trial, we have found to be correct to a certain
not entirely so: in many cases part of the coffee subsides with the
d a portion of the latter rises to the surface with the coffee, and after
f a few minutes, in general both coffee and chicory fall to the bottom,
this way we are not able to separate the two substances completely the
he other, and therefore are unable to determine exactly the quantity
gredient of which any sample professing to be coffee is made up,
e can approximately estimate the proportion of each actually present.
not to shake the suspected coffee up with the water, but to place it
n the surface; it is also advisable to experiment with powdered chicory
separately in the first instance. The reason why the coffee floats upon
is to be found in the quantity of essential oil which it contains, which
ghter than the water, which it at the same time repels; on the other
the absence of this oil which occasions the sinking of the chicory. In
these experiments, it will be observed, that the water to which coffee
been added, becomes scarcely coloured for some time, while that with
, in less than a minute, assumes a deep brown tint.

importance to know, however, that this last test is almost equally
to roasted corn, &c., as to chicory.

en further stated, that the presence of roasted corn may be detected
colour produced on the addition of a solution of iodine to the cold

decoction. We have not found this to be correct in all cases, for on addi iodine to decoctions of five different coffees ascertained to be adulterated wi roasted corn, the liquids did not become blue, but almost black, with a tinge brown or olive. This appears to arise from the obscuration of the blue colo developed by the iodine, by the rich brown colouring matter of the chicory— proportion of which almost always accompanies the adulteration with corn. Th test, however, is still very useful, in some cases, although it does not often gi rise to a colour which can be called blue. It should be known, also, that soluti of iodine, added to a cold decoction of chicory root, deepens the colour ve greatly, owing probably in part to the presence of a minute quantity of starc the increase of colour is never, however, so considerable as when flour is pres

It is to be further observed that no exact idea can be formed in this way of quantity of starch contained in the adulterated coffee, because the greater p being charred, gives no reaction with iodine.

With these explanations the above tests will be found very useful to those have not a microscope at command; but that instrument affords the only re and certain means of detecting the majority of the adulterations to which gro coffee and other vegetable powders are so subject.

In searching for roasted corn in coffee with the microscope, the fragm before being submitted to the object glass, should be well broken up with points of needles.

We have now considered all the more important adulterations to which, appears from the preceding analyses, coffee is subjected: it has been stated, h ever, that the berry is sometimes imitated; but of this no positive evidence fallen under our own observation. Some grocers make it a practice, in to give their customers confidence, to grind the coffee while they wait for it. such cases it is usual to keep a box of chicory nibs of about the size of berries upon the counter; during the grinding a handful or so of the ni adroitly transferred to the mill usually without the least suspicion being exc We shall hereafter have occasion to return more than once to the considera of the adulteration of coffee.

SUGAR, ITS IMPURITIES AND ADULTERATIO

Two kinds of sugar have been particularly distinguished by chemists — viz., and grape sugar, or glucose: the first is obtained from the sugar-cane, the root, the maple tree, and some other plants, — while the second is contai greater or less quantities in most fruits, and particularly in grapes and Honey, although usually described as consisting of grape-sugar, contai large quantity of crystallisable sugar resembling cane-sugar, and is ther probably a mixture of the two kinds.

These two sugars differ considerably in many of their properties. *Cane-* consists of oxygen, hydrogen, and carbon, in definite proportions; it is cry lisable, the crystals are six-sided oblique prisms, and when pure, not pro deliquesce, or alter when exposed to moisture or a moderate temperature.

Grape-sugar consists of the same elements, but contains a less proporti carbon. Unlike cane-sugar, its manufacture can be effected by art, that is, the action of the dilute mineral acids, particularly the sulphuric, on either st or woody fibre; it has but little disposition to crystallise; and when it does the crystals assume no definite figure, but are arranged in acicular tufts; exp to moisture, or a moderate temperature, it readily deliquesces.

Pure and *unadulterated* cane-sugar, therefore, should present a highly talline texture, should be of light colour, and free from clamminess or moist

These two sugars may be readily discriminated from each other by the a of certain tests, and grape-sugar particularly by the copper and potassa tests

Now grape-sugar is frequently met with in the brown sugars of commerce considerable quantity, and is sometimes introduced for the purpose of adultera

This adulteration Dr. Ure, in the Supplement to his "Dictionary of Mines, and Manufactures," states, can always be detected by means of the

pper test; and at page 240. that chemist thus expresses himself on this
' With my regulated alkaline mixture I never fail in discovering an
ly small portion of starch sugar, even when mixed with Muscovado
d thus an excellent method is afforded of detecting the frauds of the

rrectness of the above assertion we are not able to confirm, for the
ɔout to be adduced.

ulphate of copper and liquor potassæ are added in certain proportions
ion of grape-sugar, and heat is applied, the red oxide of copper is
ly thrown down. In a solution of pure cane-sugar no such result ensues.
loying this test in thirty-six solutions of different samples of cane-sugar,
rom grocers, we find that the red oxide was thrown down in every
had we relied implicitly on the authority above alluded to, we should,
rther investigation, have adopted the conclusion that the whole of the
tested *were adulterated* with grape or starch sugar.

formity of the result, however, excited suspicion, and we determined
ate further.

t was then applied to some sugars obtained direct from the hogshead,
the same result; the red oxide was thrown down as before; this of
led strength to previous suspicion.

ext tried in a solution of some sugar taken direct from the cane itself,
similar result. The cane from which the sugar was procured was not
t was a portion of a bamboo which had been sent over to this country.
to solutions of twelve different lump sugars the test was more or less
in three cases, and after the solutions had been boiled for a few
nd the sugar thus reduced to the state of a syrup, it became perfectly
hole twelve sugars.

employed with very dilute solutions of treacle in water, a copious pre-
the red oxide invariably subsided.

xperiments are of considerable importance, and show clearly—

t cane and grape sugars are very constantly associated, and that they
me cases, co-exist in the cane itself.

at grape-sugar is very generally, and probably invariably, present in
l sugars as imported into this country.

at it is present in nearly all the brown sugars of commerce in very
antities.

at some lump sugars even—which are in general to be regarded as
e cane-sugar—contain traces of grape-sugar, and that by the action of
ure but little exceeding 212° Fahr., they may be readily converted into
r sugar termed glucose or grape-sugar.

at treacle is in great part constituted of grape-sugar, resulting, as will
ereafter, from the decomposition of the cane-sugar itself, which takes
very great extent during its manufacture.

eral results obtained with the copper test were all confirmed by the
t; thus solutions of cane-sugar, obtained either direct from the cane,
ad, or the grocer, were, when boiled with caustic potash, more or less
the solution of the sugar taken directly from the cane was perfectly
until after boiling with the alkali, when it became deep brown.

ecomes evident that *the subsidence of even a large amount of the red
pper from the application of the copper test to solutions of cane-sugar
fficient proof of fraudulent adulteration with grape-sugar*, as it was
be formerly.

IMPURITIES OF CANE-SUGAR.

urities of cane-sugar may be divided into the organic and the in-

nic impurities consist of fragments of the sugar-cane, glucose or
r, vegetable albumen, blood, an animalcule peculiar to sugar, fungi,
e, and starch granules.

ganic impurities are lime, lead, iron, and sand or particles of stone

Now, these several impurities are not contained in the crystals t
which are pure cane-sugar, but in the more fluid and uncrystallised
sugar, that is, in the molasses of sugars, which adheres to and coats
of the crystals.

*On the Presence of Fragments of Sugar-Cane in Sugar, and on the
of the Cane.*—The juice of the cane is expressed by means of
machinery, and during the operation innumerable fragments of the
many of them of extreme minuteness, become detached, and pass into
As this in its manufacture into sugar does not undergo in general any
filtration, and as but few of the fragments drain away with the treacle,
part of them are retained in the sugar, in all unfiltered samples of
may be readily detected in great abundance by means of the microsco

For the more ready and certain identification of these fragments, it is
to give a short outline of the structure of the sugar-cane itself.

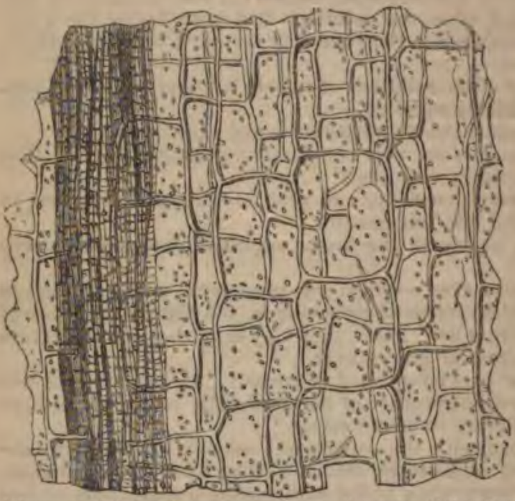
The sugar-cane belongs to the class of Endogens and the fami
Grasses; it consists of nearly cylindrical rods or stems, which are di
joints at irregular distances of some three or four inches, and its s
made up of cellular tissue, woody fibre, vessels, and epidermis.

The parenchyma, or cellular tissue, forms the most considerable
the sugar-cane, and it is constituted of aggregations of infinite
utricles or cells, in the cavities of which the juice is inclosed.

These cells are usually rather longer than broad, and in the centr
the bamboo they
ral times larger
outer and harder
membranes of
walls of the cells a
are all finely
punctated, a ch
which the cells of
cane may be cl
tinguished from
vegetable cells.

The woody
verses the cane
gitudinal directi
tinct bundles,
to transverse
dotted appearan
bundle is consti
number of gre
gated cells, and
incloses vessels;
also usually mo
dotted, like the
cells of the pare
which, indeed, t
to be merely mo
Fig. 6.

Fig. 6.



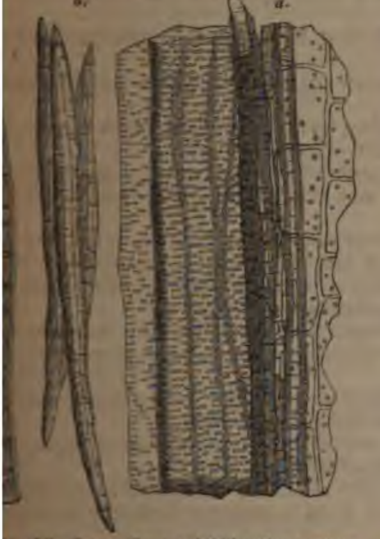
A fragment of SUGAR CANE, taken from near the centre of the stem, showing the size and character of the cells of which the parenchyma is formed, as well as, on the right, a bundle of woody fibre. Drawn with the Camera Lucida, and magnified 100 diameters.

The vessels follow the same disposition as the woody fibre, in
of each bundle of which one or more is generally included. These
of two kinds: the one is the interrupted spiral or dotted vessel, and
the simple or continuous spiral vessel. The dotted vessels are someti
drical, but frequently polygonal, from the compression exerted upon
the woody fibre, by which they are immediately surrounded, and the m
the cells forming which they frequently exhibit on their surfaces;
vessels are found chiefly in the outer and harder part of the stem;
formed of a single thread, remarkable for its thickness and strength.

The epidermis or cuticle is known by the elongated, crenate cells,
is composed, and the presence of stomata. At the distal extremity of
node of the cane, the ordinary epidermic cells are replaced or ove
layer of cells, having totally different characters; they are usually lit

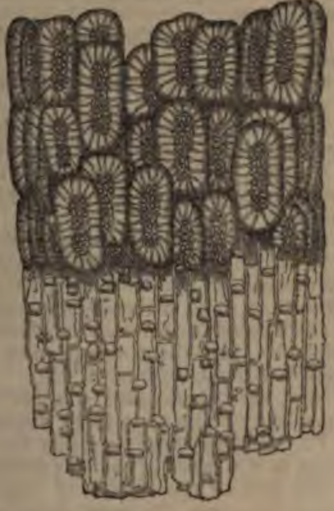
road, more or less rounded or oval in shape, with their edges marked
ort and well-defined lines, disposed in a radiate manner: these cells re-
somewhat the cells found in the stones of fruit, and they form by their
a zone round the cane, polished, hard, and of about the third of an inch
h. *Fig.* 8.

Fig. 7.



ts of the SUGAR CANE, exhibiting the structure
two kinds of vessels which enter into its com-
n, as well as the cells of which the woody fibre
stituted. *a, Dotted vessel* embedded in woody
b. cells of *woody fibre*; *c, spiral vessel.*
with the Camera Lucida, and magnified 200
ters.

Fig. 8.



A portion of the EPIDERMIS of the CANE, showing THE TWO KINDS OF CELLS of which it is composed — viz., those of which the general surface of the cane is formed, and those of which the polished zone described in the text is chiefly constituted. Drawn with the Camera Lucida, and magnified 200 diameters.

gments of sugar-cane are present in great quantity in Muscovado sugar,
sugars of the shops in general, and in "bastards," a product of the manu-
e of loaf-sugar.

y are not contained in loaf-sugar, crushed lump, sugar-candy, nor in
of the East Indian sugars: in the preparation of all these sugars the
uice undergoes a process of filtration which effectually removes all solid and
impurities.

presence of these fragments, in many cases, serves to distinguish satis-
ly cane-sugar from either beet, maple, or grape-sugar, a discrimination
otherwise it would be extremely difficult if not impossible to effect.

the same means, also, cane-sugar may be detected when mixed with beet
ch sugar, a practice which, we believe, is common in France.

saccharine juice of the beet-root is filtered, and therefore fragments of
ant are not present in the sugar made from it, as they would doubtless
re this means of purification not adopted.

presence of sugar-cane in sugar increases the bulk and weight of the
, lessens its sweetness, and thus deteriorates both its quality and value.

the Admixture of Grape with Cane-sugar, or Glucose. — Purified cane-
some of the more obvious properties of which have already been described,
most perfect form of sugar known; it is cristallisable, possesses great
ning properties, and is remarkably indisposed to undergo putrefactive or
tative changes.

e-sugar, denominated more correctly glucose, on the contrary, is a low
deficient in sweetening power, and very prone to fermentation.

therefore obvious that cane-sugar must be considered as deteriorated
ity, and consequently depreciated in value, by admixture with grape-

sugar, the deterioration and depreciation being proportionate to the amount present.

Now, lump-sugar, well refined, is entirely free, as we have seen, from grape-sugar, and this, therefore, is one of the purest forms of sugar met with in commerce.

Sugar-candy is another of the purer forms, especially white sugar-candy.

Crushed lump, and even the inferior loaf sugars, are also comparatively pure cane-sugars.

Again, certain of the sugars of the East Indies are tolerably free from grape-sugar.

On the other hand, most of the brown sugars of the shops contain a good deal of grape-sugar.

Raw or Muscovado sugar, containing, as it always does, much treacle, is contaminated with a still larger proportion of grape-sugar.

But the treacle itself, and the sugar called "bastards," contain by far the largest proportion of grape-sugar, and are, indeed, to a considerable extent, constituted of it.

It is also well it should be distinctly understood that the inferiority of such cane-sugars as contain grape-sugar largely is not in general due alone to the presence of that substance, but also to certain other impurities which usually accompany it, as vegetable albumen, fragments of cane, &c.

On Vegetable Albumen in Cane-sugar.—Vegetables, like animals, contain principles, into the composition of which nitrogen largely enters: the chief of these is vegetable albumen.

Now, these principles, whether they occur in the dead plant or animal, are remarkably prone to undergo change and decomposition.

This decomposition reacts on the non-nitrogenised substance sugar, and induces in it a series of changes including fermentation.

The greater the amount of vegetable albumen, therefore, contained in any sample of sugar, the more liable will it be to undergo fermentative and putrefactive changes.

It is the presence of this vegetable albumen in the juice of the sugar-cane which constitutes one of the great difficulties of sugar-refining. Various salts and substances, sugar included, it is known will not readily crystallise in an albuminous fluid: the efforts of the refiner, therefore, are directed to the removal of this substance, no easy task; and the more completely this removal is effected, the purer, in general, will be the sugar obtained.

In loaf-sugar, sugar-candy, and certain East Indian sugars, although they contain some albumen, yet the amount comparatively is but small.

The brown sugars in general use, raw or Muscovado sugar, treacle, "bastards," all contain albumen largely, and therefore are liable to ferment; and, indeed, as usually met with in commerce, they are actually in a state of slow fermentation as is shown by the fact, that a solution of them in warm water evolves a distinct and frequently strong odour, resembling that of sweet-wort.

It thus appears that those sugars which contain most grape-sugar ordinarily also are most contaminated with albumen.

Now, grape-sugar, as we have before said, is the form of sugar most liable to fermentation, and it is even necessary that cane-sugar, before it can ferment, should first be converted into grape-sugar; the presence of albumen, therefore tends to convert cane into grape-sugar, and so augment the amount of the latter.

But there are other evils, still more serious, connected with the presence of albumen in sugar, and which will be presently noticed.

Blood in Sugar.—The employment of the blood of animals is confined to the manufacture of loaf-sugar, and its use, we believe, is now very frequently dispensed with, even in the preparation of this article.

The blood acts only through the albumen which it contains: now, we just said, that one of the great difficulties of sugar-refining arose from the presence of vegetable albumen in the cane-juice; and here we have the apparent contradiction involved in the practice of putting albumen into the solution of sugar.

The advantages derived from the use of this substance, we presume, are considered to more than counterbalance the disadvantages attending it; and indeed ear that there is not the same difficulty in the removal of animal s experienced in the abstraction of vegetable albumen.

of its operation is as follows: the fluid albumen is diffused throughe of the sugar-solution to be clarified; on the application of heat, immediately solidifies, and forms meshes and films, which, being the water, ascend, and in their upward course carry with them the ties contained in the solution, on the surface of which a scum is rmed, consisting of the impurities in question and the solidified is scum may be removed by skimming.

is the albumen of the blood only which assists in clarifying the on, and not the blood itself, it would be far better that albumen ite of egg, should in all cases be employed.

fluid compounded of fibrin, albumen, and a variety of salts and nces; its use, therefore, in the manufacture of lump sugar, is not isting, but is calculated to prove injurious to the health.

-refiner will tell us that the whole of the blood employed is removed sses of filtration adopted. This is not the case, however, as may in readily proved by dissolving a few knobs of lump-sugar in a large warm water, and subjecting the sediment which usually falls to the icroscopic examination and chemical analysis: the first shows that ary matter consists of angular flocculi, taking the form of the inthe crystals; and the second, that it is composed of coagulated al-

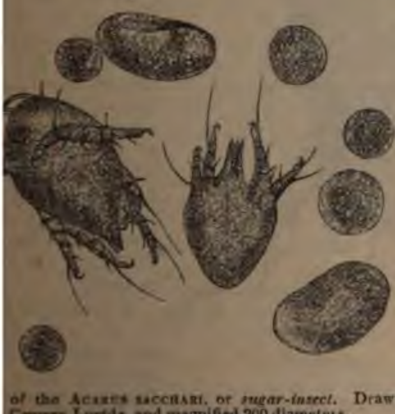
considerable advantage derived from the use of blood, is its cheaphen not merely cleanliness but health is concerned, the question of ght not to be entertained for one moment.

carus sacchari, or Sugar Insect.—There is very commonly present, impure kinds of sugar, a beetle-like animalcule, of the genus *Acarus*. very of the very general presence of this acarus rests, we believe, ourselves.

acarus approaches somewhat, in organisation and habits, the louse -insect itself, which are also included in the genus *Acarus*.

-mite is in size so considerable, that it is plainly visible to the unaided n present in sugar, it may always be detected by the following —two or three drachms or teaspoonfuls of sugar should be dissolved vine-glass of tepid water, and the solution allowed to remain at hour or so; at the end of that time the animalcules will be found, surface of the liquid, some adhering to the sides of the glass, and bottom, mixed up with the copious and dark sediment, formed of f cane, woody fibre, grit, dirt, and starch granules, which usually the solution of even a small quantity of sugar in water.

Fig. 9.

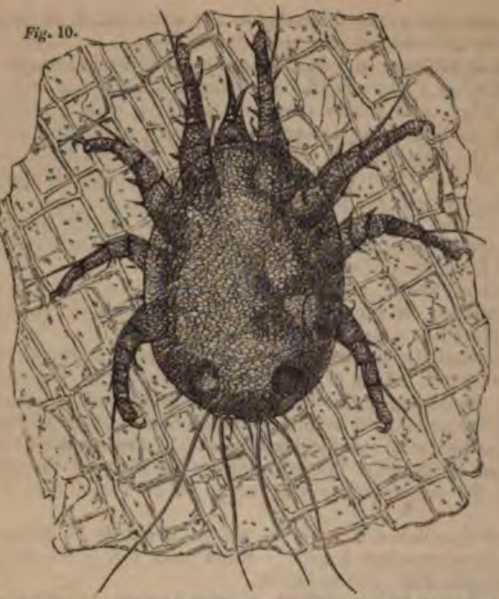


of the ACARUS SACCHARI, or *sugar-insect*. Drawn
Camera Lucida, and magnified 200 diameters.

We will now proceed to give a description of the acarus in question, and observe, in the first place, that the whole of its development may be clearly traced out in almost every sample of brown sugar.

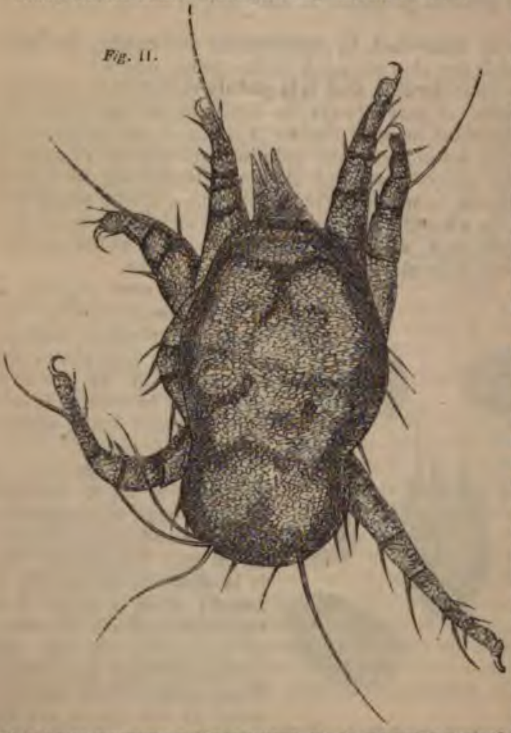
The *Acarus sacchari* is first visible as a rounded body, or egg; this gradually enlarges and becomes elongated and cylindrical until it is about twice as long as broad; after a time, from the sides, and one extremity of this ovum, the legs and proboscis begin to protrude. These stages of the development of the acarus are exhibited in the accompanying figure.

Fig. 10.



A SUGAR-INSECT of medium size, representing its attitude and appearance when alive, and as seen crawling on a fragment of cane. Drawn with the Camera Lucida, and magnified 200 diameters.

Fig. 11.



This figure represents a SUGAR-INSECT, which has nearly attained its full development, and as it frequently appears when dead. Drawn with the Camera Lucida, and magnified 200 diameters.

The acarus
formed, goes on
in size until it att
growth, when it i
the naked eye
speck.

In its perfect
structure is as foll
body is oval, or ra
what ovate, bein
behind than befor
posterior part fou
stiff bristles pro
together on each
some eight or t
ones are arranged
equal distances a
circumference of
from its anterior
boscis of complex
tion proceeds, an
inferior surface
jointed and furni
spines or hairs at
culation; the spi
issues from the las
one of each leg is
and extends mu
the termination
itself; lastly, ea
armed at its extre
a formidable hook

Many of the ab
culars are faithf
bited in the engra

In most sample
the acari may be
sizes, that is, in all
of their growth an
condition, some al
dead, some entire,
broken into fragme
here, legs there.

When the acar
the legs are most
regularly dispose
the body, and th
makes efforts to
unfrequently a
acari may be see
to fragments of
when dead the at
disposition of t
parts are changed
boscis falls on on
the legs are var
ranged.

The *Acarus sac*
to life with grea
for very warm
not always kill it,
frequently be foun
condition even aft
four hours' imme

have said that the sugar-mite is very commonly present in the less pure s—we might have asserted that it is almost constantly so, the statement based upon the examination of not less than *one hundred* different samples gar.

us the acari are usually present—
In nearly all the brown sugars as imported into this country.
In the ordinary brown sugars of the shops.
ey are not contained
In lump sugar.
In sugar-candy.
In certain of the white sugars of the East Indies, in the manufacture of which filtration is had recourse to.

a rule the number of acari present in any sample of sugar may be taken fair indication of the purity of that sugar; the purer the sugar, the freer it be from the disgusting sugar-mite. The correctness of this statement we immediately proceed to make evident.

has often happened to us to have to refute the foolish statement of ill-in- ed and unreflecting persons, that living productions are to be found in ything we eat and drink: this assertion, although unfortunately true of the r we are compelled to drink, and one or two other articles of consumption, general statement is completely at variance with the truth, and it may be y affirmed that whenever living animal or vegetable productions are con- d in our food or drink, they indicate conditions which render such food or wholly unfit for human consumption.

ery animal production, from the largest to the smallest, contains in its sition a certain proportion of nitrogen; and no animal can live for any of time on food, as on sugar, for example, which does not contain a pro- n of the same principle—viz., nitrogen.

ce, then, the sugar acari live and multiply in sugar, it is evident that they find in it some substance to feed upon containing nitrogen, and thence le of sustaining them.

substance the acari obtain in the *vegetable albumen* of which we have y spoken, and in proportion to the amount of this, in any sample of sugar, n most cases, be the number of acari contained in it.

now understand why the *Acarus sacchari* is not found in the purer sugars, np-sugar, sugar-candy, and certain sugars of the East Indies, and why it ust always present in the brown sugars of commerce, and in raw or ovado sugar.

acari are not usually present in treacle, although this contains a large ity of vegetable albumen; the reason of this is, that they require atmo- c air, and are not adapted to live for any length of time in fluids.

cers' Itch.—It is well known that grocers are subject to an affection of in, denominated "grocers' itch," of which one of the symptoms is extreme ion and itching.

this disease all grocers are not equally liable, but those more particularly re engaged in the "handling" of the sugars, as the warehousemen.

the *Acarus sacchari* actually belongs to the same genus as the *Acarus* i, or itch-insect, than which, however, it is larger, and possessed of an or- tion still more formidable and forbidding.

hus becomes extremely probable that the disease in question does really from the sugar acarus—a point, however, which nothing short of micro- observation can satisfactorily determine.

ay be contended that the eruption of grocers' itch does not resemble that is ordinarily occasioned by animalculæ; and it has been very plausibly ted by an eminent authority on the diseases of the skin, Mr. Erasmus n, that the disorder may be occasioned by derangement of the digestive s, resulting from the frequent tasting of the sugars.

cers are not the only persons subject to an eruption of the skin, attended cessive irritation, and arising from causes connected with their occupa- Bakers are also liable to a somewhat similar disease; and it is known our frequently swarms—is, in fact, "alive"—with a species of acarus, which we name "*Acarus farinæ*," and of which we shall have occasio hereafter in detail.

On Sporules of Fungi in Sugar.—Innumerable sporules of fungi generally to be observed in the less pure kinds of sugar; they occu most abundantly in those sugars which favour the development of the

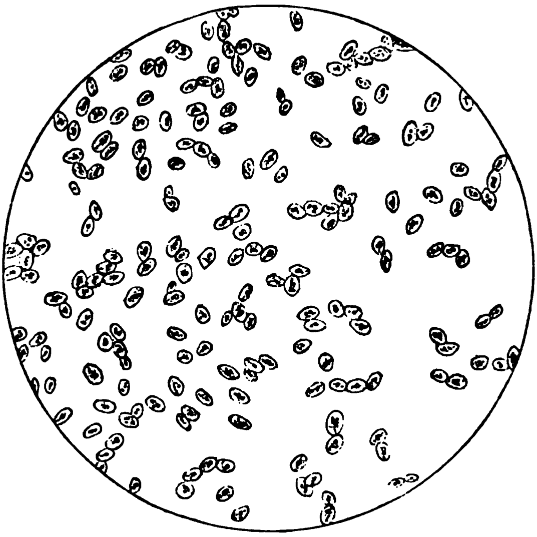
They are best seen by dissolving a small quantity of any brown water, and looking for them in the sediment which subsides, and w great extent, is constituted of the sporules in question.

These sporules are exceedingly minute bodies, usually of an oval either floating singly in the sugar-solution, or else adhering together forming litt threads. U vourable circ the sporule developed in plants or fun

Now, fung mals, contain and require ised food for port: thus th do the sugar a selves, on the *albumen* con impure suga

The presen gi in sugar, another evil from its with nitroge stances, and no doubt, i indicative o mentation of Sporules of to be foun brown sugar merce, with single except

Fig. 12.



Sporules of the Fungus found in brown sugar. Drawn with the Camera Lucida, and magnified 420 diameters.

On Starch in Sugar.—In almost every sample of brown sugar, the noticed a variable quantity of starch granules. For the presence of were for some time at a loss to account, and did not know whether th be regarded or not as evidences of adulteration: the quantity was obv small to serve the purpose of direct adulteration; but it was thought might indicate the admixture of cane with starch-sugar, prepared fr farina, and to which we shall have again to allude under the head Adulterations of Sugar."

It became manifest, however, on further investigation, that in n their presence was accidental, as not only was the number of granu but they were unchanged, so that very generally they could be refer plant to which they belonged; thus, in samples of sugar obtained di the hogshead or bag, the starch granules discovered were those of In arrow-root, sago, or tapioca; while in those samples procured fro not only were these same kinds present, but also others, as those corn, &c.

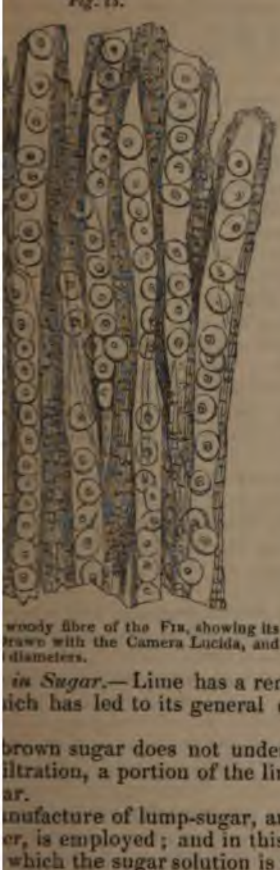
When it is remembered that the grains of starch form an almost i powder, and that the slightest breath of wind is sufficient to diffuse the the atmosphere, there is no difficulty in accounting for their presenc *brown sugars.*

But starch granules are almost constantly met with in *lump sugars* case the same explanation appears scarcely so satisfactory.

It some rare instances, however, as will be noticed shortly, the resent in sugar is so great, that it must have been designedly in-

sugar-cane contains but little starch, and as the cane-juice is sub-rolonged boiling, it is manifest that no portion of the starch found in sugar can in any case be derived from the cane itself.

Fig. 13.



woody fibre of the Fir, showing its
rawn with the Camera Lucida, and
diameters.

Woody Fibre in Sugar.—The last organic substance which we have noticed frequently in sugar occurs in the form of minute and sawdust-like fragments of deal: as these present a very beautiful and curious structure, and as without some notice or explanation they might greatly puzzle the inexperienced observer, we give an engraving of a minute fragment of wood-fibre of the fir. The presence of these fragments in brown sugar is no doubt accidental, and in most cases they are derived from the hogshead, or other wooden material with which the sugar may have come in contact.

In lump-sugar, microscopic or sawdust-like fragments, not only of deal, but also of other woods, are almost constantly seen, and this frequently in great abundance. Of their presence in this description of sugar it is not easy to give a satisfactory explanation; their number in some cases would lead to the inference that they had been designedly introduced, possibly to facilitate crystallisation, by acting as nuclei.

We have next to notice the inorganic impurities of sugar.

in Sugar.—Lime has a remarkable affinity for organic matter, and ich has led to its general employment in the purification of cane-

brown sugar does not undergo, in the course of its preparation, any iltration, a portion of the lime used may very commonly be detected ar.

nufacture of lump-sugar, an additional quantity of lime, in the form er, is employed; and in this sugar, also, notwithstanding the careful which the sugar solution is subjected, that substance may sometimes ed.

in Sugar.—In some cases, traces of lead may be detected in remp-sugar; this circumstance is explained by the use of leaden

ubject we shall not at present offer any further observations, as we ly, in a future Report, treat of the manufacture of sugar, and examine s connected with the process employed by Dr. Scoffern for the re-sugar.

n Sugar.—It occasionally, although rarely, happens that iron may in refined sugar; this, like the lead, is to be traced to the use of nsils.

ents of Stone or Grit in Sugar.—Fragments or particles of stone or most constantly be detected in brown sugar.

three sources from which these might be derived—from the imper-d cane itself; from the lime used in clarifying the cane-juice; and re during the process of crystallisation.

Results of the Microscopical and Chemical Examination of Thirty-six Brown Sugars of different Qualities and Prices.

The quantity of each sugar submitted to examination did not in general exceed one drachm, yet the following were the results.

1*st Sample.*—Contained numerous fragments of *cane*, a great many *starch granules*, and two or three pieces of *starch*, made up of aggregations of granules; several pieces of *woody fibre;* TEN OR TWELVE ACARI; *grape-sugar; vegetable albumen; lime.*

2*nd Sample.*—Numerous fragments of *cane;* a great many *starch granules*, two or three pieces of *starch;* A CONSIDERABLE NUMBER OF ACARI; much *vegetable albumen; grape-sugar*, and *grit.*

3*rd Sample.*—Not many pieces of *cane;* a moderate quantity of *starch granules*, one or two masses of *starch;* A CONSIDERABLE NUMBER OF ACARI; a few filaments and sporules of *fungus;* much *vegetable albumen*, and *grape-sugar.*

4*th Sample.*—A few minute pieces of *cane* only; a considerable number of *starch granules;* A GREAT MANY ANIMALCULES, SOME ALIVE; a few oval *ova* of same; much *albumen*, and *grape-sugar.*

5*th Sample.*—Not much *cane;* rather a small number of *starch granules*, three or four pieces of *starch;* A FEW ACARI; *albumen; grape-sugar.*

6*th Sample.*—Much *cane;* a considerable number of *starch granules*, one or two pieces of *starch;* NOT MANY ACARI; numerous *sporules*, and a few filaments of *fungus;* several fragments of *woody fibre; albumen; grape-sugar.*

7*th Sample.*—A few pieces of *cane;* a great many *starch granules*, several masses of *starch;* FIVE OR SIX ACARI; numerous fragments of *woody fibre; albumen; grape-sugar; grit.*

8*th Sample.*—Not much *cane;* a great many *starch granules;* several pieces of *starch*, formed of large cells, like those of the potato; NUMEROUS ACARI, and oval *ova* of same; much *vegetable albumen* and *grape-sugar; grit.*

9*th Sample.*—A few pieces of *cane;* many *starch granules*, and several masses of *starch;* NUMEROUS ACARI; sporules of *fungi; woody fibre; albumen; grape-sugar; grit.*

10*th Sample.*—Much *cane;* a great many *starch granules*, and several masses of *starch;* NUMEROUS ACARI, some broken into pieces; a few bits of *woody fibre; albumen; grape sugar.*

11*th Sample.*—A few pieces of *cane;* not very many *starch granules;* one or two masses of *starch;* TWO OR THREE ACARI; several *ova* of same; sporules of *fungus; albumen; grape-sugar.*

12*th Sample.*—A great many pieces of *cane*, but few *starch granules;* two or three masses of *starch* and cells, filled with *granules;* A FEW ACARI, SOME ALIVE; *albumen; grape-sugar; grit.*

13*th Sample.*—Much *cane;* a considerable number of *starch granules;* A GREAT MANY ACARI, SOME ALIVE; much *albumen; grape-sugar; grit.*

14*th Sample.*—A few pieces of *cane;* a considerable number of *starch granules*, and numerous masses of *starch;* a few filaments of *fungus* terminating in globular extremities, beset with sporules, (this fungus we have seen several times in sugar;) fragments of *woody-fibre; grape-sugar.*

15*th Sample.*—But little *cane;* a great many *starch granules*, and two or three masses of *starch;* TEN OR TWELVE ACARI; several pieces of *woody fibre;* numerous sporules, and a few filaments of *fungus; albumen; grape-sugar; grit.*

16*th Sample.*—Very little *cane;* not many *starch granules;* NUMEROUS ACARI OF LARGE SIZE, MANY ALIVE; a great many *eggs* of same; much *albumen* and *grape-sugar.*

17*th Sample.*—Very few pieces of *cane;* a very considerable number of *starch granules;* one or two masses of *starch;* AN IMMENSE NUMBER OF ACARI, some entire, some broken into fragments; a great many circular and oval *ova* of same; fragments of *woody fibre; grape-sugar;* very much *albumen.*

18*th Sample.*—But few pieces of *cane; starch granules*, and several large masses of *starch;* A VAST NUMBER OF ACARI of all sizes and in all conditions; also a great many circular and oval *ova* of same; much *albumen; grape-sugar.*

19*th Sample*—A good deal of *cane;* A LARGE QUANTITY OF POTATO FLOUR; no *acari; grape-sugar.*

20th Sample.—Much *cane ;* a very great many *starch granules ;* NOT MANY ACARI ; some *albumen ; grape-sugar.*

21st Sample.— A moderate quantity of *cane ; starch granules ;* SEVERAL ENTIRE ACARI, as well as fragments ; numerous *ova* of same ; fragments of *woody fibre ; albumen ; grape-sugar.*

22nd Sample.—A great deal of *cane ;* A VERY LARGE QUANTITY OF POTATO FLOUR ; A FEW ACARI, SOME ALIVE ; *albumen ; grape-sugar.*

23rd Sample.— A moderate quantity of *cane ;* very few *starch granules ;* SEVERAL ACARI, SOME ALIVE ; sporules, and filaments of *fungus* in tufts ; *grape-sugar ; albumen.*

24th Sample.— Numerous pieces of *cane ;* A LARGE QUANTITY OF FLOUR ; A FEW ACARI, and many *ova* of same ; *grape-sugar ; albumen ;* much *grit.*

25th Sample.—Much *cane ;* a few *starch granules ;* one or two masses of *starch ;* SEVERAL ACARI and *ova* of same ; *albumen ; grape-sugar.*

26th Sample.—Much *cane ;* not a great many *starch granules ;* a few *potato cells ;* ACARI ; fragments of *woody fibre ; grape-sugar ; albumen.*

27th Sample.— Much *cane ;* a considerable number of *starch granules ;* several cells filled with granules like *potato* cells ; A FEW ACARI ; numerous sporules of *fungus ; woody-fibre ; albumen ; grape-sugar ;* much *grit.*

28th Sample.— Not much *cane ;* a very great number of *starch granules ;* several masses of *starch* visible to the naked eye ; NOT MANY ACARI ; *grape-sugar ; albumen.*

29th Sample.— A few pieces of *cane ;* not many *starch granules ;* A GREAT MANY ACARI, SOME ALIVE ; numerous *ova* of same ; two or three fragments of *woody fibre ; grape-sugar ; albumen.*

30th Sample.— Very little *cane ;* a considerable number of *starch granules* and several masses of *starch ;* A FEW ACARI ; *grape-sugar ; albumen ; grit.*

31st Sample.—A few pieces of *cane ;* not many *starch granules ;* cells like those of *potato,* adhering so as to form little masses ; AN IMMENSE NUMBER OF ACARI, MANY ALIVE, and numerous *ova ;* sporules of *fungus ; grape-sugar ;* much *albumen.*

32nd Sample.— Much *cane ;* not many *starch granules ;* A VERY GREAT MANY ACARI ; numerous *ova* of same ; sporules and filaments of *fungi ; grape-sugar ; albumen.*

33rd Sample.— No *cane ;* a great many *starch granules* and masses of *starch ;* TWO OR THREE ACARI ONLY ; no sporules of *fungus,* and no *grit ;* a very little *grape-sugar ; albumen.*

(This sugar presented a highly crystalline texture, and was nearly as white as lump-sugar ; the absence of all solid impurities showed that it had been subjected to filtration.)

34th Sample.— A few pieces of *cane ;* MUCH FLOUR ; several cells like those of *potato ;* A GREAT MANY ACARI, SOME ALIVE ; *grape-sugar,* and much *albumen ;* a little *grit.*

35th Sample.— But little *cane ;* a great many *starch granules ;* two or three masses of *starch ;* several *potato cells* filled with *granules ;* NUMEROUS ACARI, and many *ova ; grape-sugar ; albumen.*

36th Sample.— Much *cane ;* a few *starch granules ;* ONE OR TWO ACARI ; a few minute fragments of *woody fibre ; grape-sugar ; albumen.*

An analysis of the above Table shows—

1st. That fragments of *cane,* frequently so minute as to be visible only with the microscope, were detected in all the sugars except one, that being a very white sugar, and evidently purified by filtration, so as to cause it to approach in character refined or lump-sugar.

2nd. That *the disgusting-looking Acari were present in Thirty-Three out of the Thirty-Six sugars,* and in nineteen cases in very considerable numbers.

3rd. That sporules and filaments of *fungus* were present in at least Ten cases. (From subsequent examinations we have ascertained that sporules of fungus are almost invariably present in brown sugars.)

4th. That *grape-sugar* was detected in the whole thirty-six sugars, often in very considerable amount.

5th. That the whole of the sugars contained a variable proportion of vegetabl *albumen.*

6th. That a greater or less number of pieces of *woody fibre* were noticed i nearly all the sugars.

7th. That *stony particles* or *grit* were observed in at least eleven instances.

8th. That a variable quantity of *starch* or *flour* was contained in each samp of sugar submitted to examination, either in the form of free granules, aggregations of granules and cells.

9th. That in *four* of the sugars the amount of flour was so considerable, th it had evidently been employed for the purpose of adulteration.

We will now proceed to relate the results obtained by the examinatio samples of refined or lump sugar.

RESULTS OF THE MICROSCOPICAL AND CHEMICAL EXAMINATION OF FIFT SAMPLES OF LUMP-SUGAR OF DIFFERENT QUALITIES AND PRICES.

The quantity of sugar submitted to examination in each case was about h an-ounce.

37*th Sample.* — A considerable number of *starch granules;* flocculi of *ani matter;* a great many fragments of *woody fibre.*

38*th Sample.* — Much *starch*, partly in lumps, visible to the naked eye; flocc of *animal matter;* a great many minute pieces of *woody fibre.*

39*th Sample.* — A few *starch granules;* flocculi of *animal matter;* many pie of *woody fibre;* a little *grape-sugar.*

40*th Sample.* — A few *starch granules;* several masses of *starch* and *pot cells*, filled with *granules;* flocculi of *animal matter;* a great many ch or minute fragments of *wood.*

41*th Sample.* — A considerable number of *starch granules;* and several ma of *starch* visible to the naked eye; flocculi of *animal matter;* a few pie of *woody fibre* only.

42*th Sample.* — A few *starch granules;* one or two pieces of *starch;* flocc of *animal matter;* several fragments of *woody fibre.*

43*th Sample.* — Very few *starch granules;* a considerable number of fragm of *woody fibre;* traces of *grape-sugar.*

44*th Sample.* — A few *starch granules;* a dozen fragments or so of *woody fi*

45*th Sample.* — A few *starch granules;* two or three cells of *potato;* hundr of fragments of *woody fibre*, forming at the bottom of the glass a sedim of *saw-dust.*

46*th Sample.* — A few *starch granules*, and one or two aggregations of *gran* a very great many pieces of *woody fibre;* traces of *grape-sugar.*

47*th Sample.* — A few granules of *starch;* flocculi of *animal matter* abund two or three dozen fragments of *woody fibre.*

48*th Sample.* — A small number of *starch granules;* one or two aggreg of *granules;* a few microscopic fragments, or chips of *wood.*

49*th Sample.* — A considerable number of *starch granules;* several *potato* c flocculi of *animal matter;* a few fragments of *woody fibre.*

50*th Sample.* — A few *starch granules;* a little *animal matter;* a very fragments of *woody fibre.*

51*th Sample.* — *Starch granules* rather numerous; several cells of *potato* fi with granules of *starch;* flocculi of *animal matter* abundant.

From an examination of this Table it appears —

1st. That in none of the sugars were fragments of *cane* present; these havi been separated by the filtration through charcoal to which sugar in proc of refinement is subjected.

2nd. That in no case were *acari* observed.

3rd. That in three of the sugars only were traces of *grape-sugar* to be detect

4th. That in none of the sugars were sporules of *fungi* to be seen.

5th. That a variable, although small, quantity of *flour* was present in the wh *fifteen* sugars.

6th. That *animal matter* was observed in *ten* cases.

7th That *sawdust-like fragments of woody fibre* were present in twelve cases, being very abundant in at least *seven* of the sugars.

For the presence of even a small quantity of flour in lump-sugar it is not easy to account satisfactorily; and as all we could say on this point would be conjectural, we shall not at present offer any further observations upon it.

We are in the same position of uncertainty with respect to the fragments of woody fibre, but we have elsewhere suggested a possible use and explanation of their presence in sugar.

The animal matter so generally present is no doubt a portion of that used in the clarification of the sugar solution.

Contrasting, then, the condition of moist and lump sugar, as met with in commerce, it is evident that the impurities of the former are much greater, and of a more objectionable character, than those of the latter; that while in the one there are very commonly present the repulsive insects or acari, sporules and filaments of fungi, grape-sugar, albumen, grit, starch and woody fibre, the other is at least free from the majority of these impurities.

We will, in the next place, give the results furnished by the examination of several samples of brown sugar, the produce of various colonies and countries; we shall thus be in a position to judge of the state in which many of the sugars imported into this country arrive.

The samples submitted to examination but little exceeded one drachm.

Results of the Microscopical and Chemical Analyses of Samples of various Brown Sugars, the Produce of different Countries.

Madras.—Sugar dark, moist, staining the paper; somewhat crystalline, crystals small: contains fragments of cane; *several acari;* very few starch granules; grit; much grape-sugar and vegetable albumen.

Madras.—Contains a few pieces of cane; starch granules; much grit; *several acari* and ova; grape-sugar; albumen.

Mauritius.—Contains much cane; *ten or twelve acari*, of large size; several ova of same; a few starch granules; fragments of woody fibre; grit; much grape-sugar and albumen.

Mauritius.—Contains some cane; *several acari;* a few starch granules — those of arrow-root; grit; grape-sugar and albumen.

Calcutta.—Sugar not very dark, dry; earthy-looking; but few crystals apparent, and those very small; not much cane; a few starch granules; grit; *no acari* visible; grape-sugar; albumen.

Calcutta.—Sugar perfectly white, dry, and highly crystalline, resembling crushed lump; a few starch granules; *no acari*, fungus, cane, or grit; scarcely a trace of grape-sugar or albumen.

Bombay.—Sugar exceedingly dark-coloured, earthy, and damp: contains some cane; a great many starch granules; (sago?) *numerous acari;* much grape-sugar; albumen.

Cassipore, Calcutta.—Sugar pale straw-colour, dry and highly crystalline, large-grained; a very few pieces of cane; *one small acarus;* a few starch granules; scarcely a trace of albumen or grape-sugar; a little grit.

Cassipore, Calcutta.—Sugar pale straw-colour, not very dry, fine-grained, the crystals being very small: contains a few pieces of cane; starch granules; *several acari* of large size; much grit; a little grape-sugar and albumen.

Jamaica.—Sugar dark-brown, not very dry, but still not staining the paper, tolerably large-grained and crystalline: contains much cane; *several acari* and ova of same; a few starch granules; no grit.

Rio de Janiero.—Contains much cane; *several acari* and ova of same; a great many starch granules, like those of Indian corn; much grit; grape-sugar and vegetable albumen.

On an attentive consideration of the above *Eleven* analyses, it appears that only two of the sugars could be fairly regarded as pure, and in a condition fit for human consumption—the white, large-grained Calcutta sugar, resembling crushed lump; and the pale straw-coloured, large-grained, highly crystalline, Cassipore sugar. Of these *samples, that from* Calcutta was by far the best.

It would be a great advantage if the above-described sugars could be introduced in large quantity into this country, and sold at moderate prices.

The last analyses which we propose to give are those of samples of sugars procured from the establishments of various grocers.

Results of the Microscopical and Chemical Examination of Numerous Brown Sugars, of all Qualities and Prices, purchased at the Establishments of various Grocers resident in the Metropolis.

The quantity of sugar submitted to analysis in each case was three drachms.

1st Sample.—Purchased in Gracechurch-street, City.

Sugar crystalline and light-coloured; contains a few fragments of cane; *numerous acari, some alive;* sporules of fungus; vegetable albumen; a small quantity of grape-sugar.

2nd Sample.—Purchased on Ludgate-hill.

Sugar coarsely crystalline, light-coloured, wetting and staining the paper in which it was folded considerably; contains *hundreds of acari*, numerous ova of same; much cane; sporules of fungus; two or three fragments of wood; a few starch granules; grit; vegetable albumen; grape-sugar.

3rd Sample.—Purchased in High-street, Whitechapel.

Sugar rather earthy, intermixed with a few minute and shining crystals; contains a little cane; *hundreds of acari;* sporules of fungus; much grit; vegetable albumen; grape-sugar.

4th Sample.—Purchased in Whitechapel-road.

Sugar fine-grained, rather light-coloured; contains numerous fragments of cane; *several acari*, and ova of same; sporules of fungus; a few pieces of woody fibre; albumen; grape-sugar.

5th Sample.—Purchased in Whitechapel-road.

Sugar scarcely crytalline, presenting an earthy appearance; contains fragments of cane; *hundreds of acari*, some alive, and many ova of same; sporules of fungus; albumen; grape-sugar; and much *tapioca starch*, with which the sample is adulterated.

6th Sample.—Purchased in Whitechapel-road.

Sugar coarsely crystalline, dark-coloured, and moist, wetting and staining the paper considerably; compounded evidently of two sugars of different colours and qualities, imperfectly mixed; contains *a few acari;* sporules of fungus; a few pieces of woody fibre; albumen; grape-sugar; it deposits, when dissolved, a copious sediment, which consists principally of the sporules of the fungus.

7th Sample.—Purchased in Whitechapel-road.

Sugar dark-coloured, not highly crystalline, crystals minute, paper stained; contains *a great many acari*, and ova of same; sporules of fungus; one or two pieces of woody fibre; grit; albumen; grape-sugar.

8th Sample.—Purchased in Whitechapel-road.

Sugar presenting rather an earthy appearance, but few crystals being visible, and these very small; contains numerous fragments of cane; *hundreds of acari;* a great many sporules of fungus; grit; albumen; grape-sugar.

9th Sample.—Purchased in High-street, Whitechapel.

Sugar coarsely crystalline; contains a great many pieces of cane; *numerous acari*, several ova of same; sporules of fungus; a few starch granules; grit; albumen; grape-sugar.

10th Sample.—Purchased in High-street, Whitechapel.

Sugar coarsely crystalline; contains *two or three acari*, and ova of same; much cane; grit; albumen; grape-sugar.

11th Sample.—Purchased in Aldgate.

Sugar earthy, scarcely at all crystalline, dark; contains much cane; *hundreds of acari;* a great many sporules of fungus; several pieces of woody fibre; starch granules; grit; albumen; grape-sugar.

12th Sample.—Purchased in Clare-market.

Sugar earthy, scarcely at all crystalline, dark; contains fragments of cane; *a considerable number of acari;* sporules of fungus; granules of starch; grit; grape-sugar; albumen.

13th Sample. —Purchased in Clare-market.

Sugar earthy, scarcely at all crystalline; contains fragments of cane; *hundreds of acari, some alive;* sporules of fungus; starch granules; albumen; grape-sugar; grit.

14th Samples.—Purchased in Blackmoor-street, Clare-market.

Sugar coarsely crystalline, evidently consisting of two different kinds intermixed; not much cane; *a few acari;* sporules of fungus; grape-sugar; albumen.

15th Sample.—Purchased in Drury Lane.

Sugar earthy, dark; contains pieces of cane; *a considerable number of acari;* ova of same; sporules of fungus; starch granules; grape-sugar; albumen.

16th Sample.—Purchased in Drury-lane.

Sugar earthy, light-coloured; contains much cane; sporules of fungus; grape-sugar; albumen; and *swarms with acari.*

17th Sample.—Purchased in Drury-lane.

Sugar earthy, dark-coloured, evidently consisting of two different sugars intermixed; contains fragments of cane; *a great many acari;* sporules of fungus; grit; albumen; grape-sugar.

18th Sample.—Purchased in Drury-lane.

Sugar earthy, dark-coloured, moist, staining the paper greatly; contains fragments of cane; sporules of fungus; grape-sugar; albumen; and *swarms with acari.*

19th Sample.—Purchased in Drury-lane.

Sugar earthy; contains fragments of cane; *an immense number of acari;* numerous ova of same; sporules of fungus; starch granules a few; woody fibre; grit; albumen; grape-sugar.

20th Sample.—Purchased in Drury-lane.

Sugar very earthy, dark; *adulterated with much potato flour,* containing *hundreds of acari*; sporules of fungus; fragments of cane; grape-sugar; albumen; grit.

21st Sample.—Purchased in Holborn.

Sugar rather earthy, light-coloured; contains fragments of cane; *hundreds of acari;* sporules of fungus; grit; grape-sugar; albumen.

22nd Sample.—Purchased in New Church-street, Edgeware-road.

Sugar earthy, dark; contains much cane; *hundreds of acari;* ova of same; sporules of fungus; a few starch granules; one or two pieces of woody fibre; grit; albumen; grape-sugar.

23rd Sample.—Purchased in Edgeware-road.

Sugar rather earthy, intermixed with a few small and shining crystals; *swarming with acari;* contains sporules of fungus; albumen; grape-sugar; but not much cane.

24th Sample.—Purchased in Edgeware-road.

Sugar coarse-grained, crystalline; contains fragments of cane; *a considerable number of acari;* sporules and thallus of fungus; grape-sugar; albumen.

25th Sample.—Purchased in Edgeware-road.

Sugarrather earthy, consisting of a mixture of two different kinds apparently, and containing fragments of cane; *hundreds of acari;* sporules of fungus; albumen; grape-sugar.

26th Sample.—Purchased in Edgeware-road.

Sugar light-coloured, rather crystalline, containing fragments of cane; a *considerable number of acari;* sporules of fungus; a few starch granules; albumen; grape-sugar.

27th Sample.—Purchased in Goodge-street, Tottenham-court-road.

Sugar light-coloured, crystalline, crystals small; paper a little stained; contains fragments of cane; a *considerable number of acari, some alive;* sporules and much thallus of fungus; a great many starch granules, those of West India arrow-root; grit; albumen; grape-sugar.

28th Sample.—Purchased in Broad-street, Bloomsbury.

Sugar somewhat crystalline, crystals small; *swarming with acari;* contains sporules of fungus; fragments of cane; a few starch granules; one or two pieces of woody-fibre; albumen; grape-sugar; grit.

29th Sample. — Purchased in High-street, Marylebone.
Sugar earthy, staining the paper slightly; contains *acari by hundreds* cane; sporules of fungus, a great many; a few starch granules; albumen grape-sugar; much grit.

30th Sample. — Purchased in Crawford-street, Edgeware-road.
Sugar earthy, consisting of two different kinds intermixed; *swarming wi acari, some alive,* others dead and broken into fragments; contains can starch granules; one or two pieces of woody fibre; albumen; grape-sugar sporules of fungus.

31st Sample. — Purchased in High-street, Marylebone.
Sugar evidently mixed, and made up of two different qualities; contain numerous fragments of cane; a *considerable number of acari;* sporules fungus; a few starch granules; grape-sugar; albumen; grit.

32nd Sample. — Purchased in Tottenham-court-road.
Sugar crystalline; rather light-coloured; made up of two different colou and qualities; contains much cane; *hundreds of acari;* sporules of fungu grape-sugar; albumen; a little grit.

33rd Sample. — Purchased in Tottenham-court-road.
Sugar presenting a very earthy appearance; contains a *considerable numb of acari*; not much cane; sporules of fungus; numerous starch granul altered by boiling; one or two pieces of woody fibre; grape-suga albumen.

34th Sample. — Purchased in Tottenham-court-road.
Sugar somewhat crystalline, staining and wetting the paper very muc contains a little cane, *acari by hundreds;* a great many sporules fungus; one or two fragments of woody fibre; grape-sugar; albumen.

35th Sample. — Purchased in Tottenham-court-road.
Sugar somewhat crystalline; paper slightly stained; contains much ca *several hundreds of acari;* a great many sporules of fungus; grap sugar; albumen; grit.

36th Sample. — Purchased in Holborn.
Sugar earthy, dark; contains much cane; *swarms with acari* and numerous of same; a great many sporules of fungus; albumen; grape-sugar; gr

From an examination of the above Table it appears —

1st. That the *Sugar insect* or *Acarus was present in the whole of the sug* the majority of samples containing them in great numbers.

2nd. That *sporules of fungus were likewise present in all the sugars.*

3rd. That *two* out of the *thirty-six sugars* were adulterated with flour, one w *tapioca starch*, and the other with *potato-flour:* the adulteration in first case was no doubt effected prior to the importation of the sugar this country, and in the other it was evidently the work of the retail gro

From the earthy appearance presented by many of the sugars exami they were probably the produce of the East Indies.

THE ADULTERATIONS OF SUGAR.

The character of the adulterations to which any article is liable, will of co vary with the article itself, and depend upon its nature and composition.

Thus the adulterations to which the brown sugars of commerce are sub have relation to their composition, and a knowledge of the various proce adopted in the manufacture of sugar.

Substances entirely different from sugar in their nature are but seldom e ployed in the adulteration of that commodity, the grocers having recours proceedings more natural and more difficult of detection, but scarcely less honest, than the introduction of foreign matters possessed of wholly diffe properties.

The Mixing or "Handling" of Sugar consists in the mixing together, in vari proportions, of sugars of different qualities and prices, none of which are v pure, and some highly impure: an article is thus prepared, presenting a toler appearance to the eye, but which is really one of very great impurity, and rat what it professes to be, "real Jamaica," or "Demarara sugar," &c.

The impure sugars are dark-coloured; imperfectly crystallised, heavy, a clammy, readily caking into masses: examined with the microscope they are found to contain fragments of cane, woody fibre, grit, &c., and to abound with the acari and sporules of fungus.

The raw or Muscovado sugar of the West Indies is of this nature, as well as, indeed, to a less extent, nearly all the brown sugars imported into this country.

Now these inferior sugars are largely employed to mix with the whiter and drier sugars of the East Indies and the Mauritius, and are thus sold to the public.

The *large-grained* and white sugars are not well adapted for this process of mixing or "handling," as they will not conceal sufficiently the impure sugars with which they are mixed, and so hide the deception practised; they are not, therefore, purchased for this purpose, but in place of them, inferior and *small-grained* descriptions of sugar, termed "grocery sorts."

We have seen that nearly all the brown sugars imported into this country contain a large amount of impurity, but in general the sugar procured from the grocer does not alone contain this same amount, but it is increased, sometimes doubled and trebled, by the use of variable proportions of other sugars still more impure, in fact, the most impure that can be purchased, so that in the state in which it reaches the public it is very unfit for use.

The injurious tendencies of this system are not confined to the public, the purchasers of the impure article, but it extends even to the sugar-producer, who is not only not encouraged to send to market a pure and good article, but is compelled to produce an inferior one to meet the views of "the adulterating grocer." While for the bad article there are purchasers enough, for the good there is scarcely any sale or encouragement: the little that is sold is bought more for the purpose of being conspicuously displayed in the grocer's window, and so to tempt the passer-by, than for actual sale.

To show that these statements are not overdrawn, we will quote, first, a short extract from the "City Article" of *The Times* for January, the 11th instant:—

"The grocery sorts still attract attention, and realise high prices, but refining and graining classes have been rather neglected."

And second, a few paragraphs from the work of Dr. Scoffern, on the Manufacture of Sugar.

"If the West Indian sugar-growers were to be furnished at once with a never-failing means of producing a large-grained, and therefore an easily cured, sugar, to the exclusion of all other sorts, their produce would have to encounter a difficulty which the consumer would scarcely have imagined. Such large-grained sugars are very unfavourable to the perpetration of certain mysterious operations of legerdemain[*], which grocers understand too well. They will not mix. A small-grained sugar may readily be incorporated with glucose, with pieces or bastards, and other less innocent bodies, without such incorporation being discoverable to the eye. A large-grained sugar, on the other hand, is a most refractory material for these little manipulations: its crystals, no matter how mingled with contaminating agents, never ceasing to manifest their native brilliancy, and thus proclaiming the fraud. It is most easy, then, to understand why the grocer, as a rule, does not encourage these large-grained sugars. He cannot '*handle*," them, and therefore brands them with a fault. He says they are deficient in saccharine matter—that they will not sweeten. True it is, that comparatively small portions of these large-grained sugars are sold, and sold at high prices, but merely as fancy articles, on the proceeds of which the grocer nets too little to make their sale an object of primary solicitude.

"Such is the source of one prejudice against dry and large-grained sugars—a prejudice originating amongst the grocers. There is also another, which originates amongst refiners, who are adverse to the general consumption of these beautiful colonial sugars, for the very obvious reason that the consumption of their own staple is thereby lessened."

On the Adulteration of Sugar with Flour.—But grocers do in some cases introduce foreign substances into sugar; thus we have seen that it is sometimes adulterated with flour. This is used, probably not so much because it is cheaper, but partly to improve the colour of very dark and bad sugar, and partly to cause the absorption of the water of the treacle with which dark-coloured sugar are in general contaminated.

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[*] *Termed by grocers, "handling."*

On the Adulteration of Cane with Potato Sugar. — Grape-sugar or glucose, a we have already stated, may be made from either starch or woody fibre by th action of dilute sulphuric acid.

Some years since this sugar used to be largely prepared in this country fro potato-flour, and as it was sold much under the price of cane-sugar, it found ready sale, grocers employing it for the purpose of adulteration.

The Excise authorities becoming acquainted with the fact of the extensi manufacture of potato-sugar, imposed a duty upon it, since which we believ it has ceased to be prepared.

On the Adulteration of Cane-Sugar with Gum or Dextrine. — We have be informed that British gum is not unfrequently used to adulterate sugar.

This substance is prepared usually from potato-flour by exposing it to certain temperature in an oil-bath.

As the starch granules are usually not entirely destroyed by the temperatur which they have been exposed, but are only so far altered in their compositi as to become partially soluble in water, their detection in sugar by mean the microscope would not be difficult.

We have not ourselves as yet met with a sample of sugar adulterated w "British gum."

ON THE MEANS OF DETECTING THE IMPURITIES AND ADULTERATIONS OF SUGAR.

The impurities and adulterations of sugar may be detected by the appear of the sugar, by the touch, by the effect of its contact with paper, by t microscope, and by chemistry.

By the Appearance. — A *pure sugar* is light-coloured, highly crystalline, a very dry. *Impure sugars* are dark-coloured, imperfectly crystalline, s grained, often presenting an earthy appearance, damp, and heavy.

By the Touch.—A good sugar should be perfectly dry to the touch, and sh not feel in the least sticky or clammy when pressed between the fingers; on other hand, a bad sugar, when treated in the same way, feels moist and sticky

The Effect of Contact with Paper. — The thickness of the sugar-paper u by grocers has often attracted observation, and it has been supposed that i employed on account of its weight. The true reason, however, is to be fo in the absorbent powers of the paper.

Now the quantity of moisture present in most of the sugars of the shop very great, and its amount may be taken as an indication of the extent of t admixture with grape-sugar, treacle, &c.

When the quantity of water is great, the thick sugar-paper absorbs a por of the fluid, and becomes wetted and stained, the extent of the discoloration, the state of the paper, as respects moisture, affording a very good criteri to the quality of the sugar.

This is a very simple and excellent method of ascertaining, in many ca the quality of sugar, which, in addition to staining the paper, if impure f admixture with treacle and grape-sugar, will also become hard and caked; doubtful cases, the sugar should be allowed to remain in the paper two or th days.

Judged by this simple test, we perceive that the quality of no less than ei out of thirty-six sugars, the results of the examination of which we have alre considered, is open to objection, as in that number the papers were more or l discoloured and wetted; in some instances the paper was saturated with w and the change of colour involved the whole of the paper; in others, that s of the paper only was affected upon which the sugar had been allowed to r the watery and treacly parts of it having passed to that side by gravitation.

Now the quantity of this water present in many sugars is so great, tha *adds very considerably to the weight;* for every drachm of water to the p of sugar there must be just so much less of pure cane-sugar; so that, as a quest of economy merely, puting aside all ideas of purity, cleanliness, and health, it very doubtful whether the public—even that large portion of it, the poor become gainers by the purchase of the cheaper, less pure, and much heavier, sugars.

By the Microscope.—By means of this instrument the presence of the sugar acari, the sporules of fungus, fragments of cane, wood, and starch granules, may be ascertained, and the adulteration by means of flour &c. determined.

By Chemistry.—The presence of grape-sugar, vegetable albumen, lime, &c., may be ascertained.

A FEW WORDS OF ADVICE, ADDRESSED TO THE PUBLIC ON THE PURCHASE OF SUGAR, TO THE GROCER, AND TO THE REFINER OF SUGAR.

We have now adduced incontestable evidence of the impure condition of the majority of brown sugars, as imported into this country, and particularly as vended to the public. These impurities prevail to such an extent, and are of such a nature,—consisting of live animalculæ or acari, sporules of fungus, starch, grit, woody-fibre, grape-sugar, &c.,—that we feel compelled, however reluctantly, to come to the conclusion, that *the brown sugars of commerce are, in general, in a state wholly unfit for human consumption.*

One portion of our advice to the public must therefore be, not to purchase the inferior brown sugars of the shops.

We have also clearly shown that lump-sugar is free from the greater part of the impurities and adulterations by which brown sugar is so largely contaminated and deteriorated; it does not contain *acari*, fungi, grape-sugar, albumen, or grit, the chief impurities consisting of starch granules and microscopic chips or fragments of woody fibre.

We recommend, therefore, the more general use of refined or lump-sugar.

The quality of the lump-sugar is comparatively a secondary consideration, as the worst lump-sugar is infinitely more pure than the best brown sugar that can be obtained.

To secure, however, the great desideratum of a pure sugar, clean, wholesome, and free from contamination, animal, vegetable, or earthy, the public must be content to pay somewhat higher prices than they do now for a heterogeneous article called by a misnomer, "sugar."

But we would at the same time address a few words to the grocer and the refiner.

To the grocer we remark, it is not in general the public who dictates prices to the tradesman, but the tradesman to the public; let the grocer therefore determine to abandon the present vicious system of mixing a sugar, at the best very impure, with another sugar, still more impure, and resolve to sell nothing but a good article, demanding for it a fair and remunerative price. To all who will follow the straightforward and honest course here recommended, we will give the utmost encouragement and assistance in our power, and such may rest assured that, in the long run, they will be largely the gainers, in pocket, character, and in their own conscientious feelings.

The sugar-refiner we strongly urge to prepare a cheaper form of purified sugar, in powder, analogous to crushed lump; such a sugar, we are informed, is extensively employed in Scotland, and we doubt not but that it would meet with a large and ready sale in this country.

ARROW-ROOT, AND ITS ADULTERATIONS.

THE term "arrow-root" was originally applied to the rhizome or root of *Maranta arundinacea*, in consequence of its supposed efficacy in counteracting the effects of wounds inflicted by poisoned arrows.

Of late years, the signification of the term has been much extended, and it is now employed to designate almost every fecula which bears any resemblance to true or Maranta arrow-root, no matter how dissimilar the plants may be from which it is obtained.

Attending this enlarged use of the word arrow-root are certain disadvantages. Many persons consider that all arrow-roots constitute one and the same article, varying only in quality, and according to the place from which they are procured; while but few persons are aware that there are several distinct kinds of arrow-root, the produce of distinct plants, great uncertainty and confusion being thus created.

To increase this confusion, the word "genuine" is often prefixed to the term "arrow-root," and as there are several kinds of arrow-root, so must there be several genuine arrow-roots: these vary in value from a few pence to two or three shillings the pound—from, in fact, the value of genuine Maranta arrow-root to that of genuine potato arrow-root. With these particulars the public at large is but ill acquainted.

The difficulty and confusion is still further enhanced by applying to the arrow-root, as is generally done, the name of the place from which it is obtained: thus we have genuine West Indian, Jamaica, Demerara, Bermuda, St. Vincent, East Indian, Brazilian, African, Guinea, Sierra Leone, Portland, British, and a variety of other arrow-roots. Some persons suppose that each of these names represents a different kind of arrow-root; others imagine that they all indicate one and the same production; while the fact is, that in some cases, as in that of East India arrow-root, one name may be indiscriminately applied to two distinct kinds of arrow-root, and in others, six or eight names all signify but a single kind or species, as is the case with West India arrow-root. This great variety of names is objectionable, not merely because it tends to confuse the public, but because it offers to the fraudulent great facilities for adulteration and imposition, of which, as we shall see hereafter, they have not failed to avail themselves.

The remedy for this state of things is simple: each really distinct arrow-root, that is, every arrow-root which is the product of a distinct plant, should be designated by the name of the species from which it is derived, as Maranta, Curcuma, Tacca, Manihot, Arum, Potato Arrow-root, &c.

The employment of these terms should not be optional, but *compulsory*, for the better protection of the public against fraud in this article of food. The propriety of this suggestion will become still more evident as we proceed.

We shall now describe each kind of arrow-root separately, observing of them all, that when pure they are non-nitrogenised substances, and therefore adapted to the formation of the fat of the body, and to the maintenance of respiration and temperature.

Maranta Arrow-Root.

Maranta arrow-root is obtained from the rhizomes of *Maranta arundinacea*, one of the family of the *Marantaceæ*.

A rhizome is an underground jointed stem placed horizontally in the earth, giving off from its upper surface, branches, and from the lower, roots; the starch or fecula is contained in the joints of the rhizome, being deposited in innumerable minute cells.

The following account of its preparation is given by Dr. Pereira in the new and greatly improved edition of his "Materia Medica:"—

"The starch, or fecula, is extracted from the roots (tubers), when these are about ten or twelve months old. The process is entirely a mechanical one, and is performed either by hand or by machine.

"In Jamaica it is procured as follows:—The tubers are dug up, well washed in water, and then beaten in large, deep, wooden mortars to a pulp. This is thrown into a large tub of clean water. The whole is then well stirred, and the fibrous part wrung out by the hands and thrown away. The milky liquor being passed through a hair-sieve, or coarse cloth, is suffered to settle, and the clear water is drained off. At the bottom of the vessel is a white mass, which is mixed with clean water, and drained; lastly, the mass is dried on sheets sun, and is pure starch.

"In Bermuda, the roots are first deprived of their paper-like scales, and then rasped by a kind of wheel-rasp, and the fecula well washed through sieves and carefully dried.

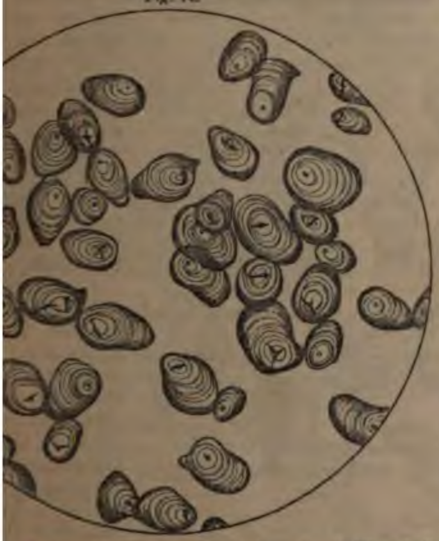
"Upon the Hopewell estate in the island St. Vincent, the carefully skinned vashed, then ground in a mill, and the pulp washed in tinned-copper washing machines. The fecula is subsequently dried in drying-houses. obtain the fecula free from impurity, pure water must be used, and nd attention paid in every step of the process. The skimming or he tubers must be performed with great nicety, as the cuticle con- ious matter, which imparts colour and a disagreeable flavour to the rman silver palettes are used for skimming the deposited fecula, and he same metal for packing the dried fecula. The drying is effected ered by white gauze to exclude dust and insects."

unadulterated Maranta arrow-root should be of a dull and opaque r, crepitating or crackling when pressed between the fingers, and about twice its weight of concentrated hydrochloric acid it should *ique* paste.

e characters and appearances may all, however, be assumed by certain arrow-roots; the microscope, therefore, affords the only ready and ns of distinguishing this arrow-root from all other species, and from each other.

l with that instrument the granules or particles of Maranta arrow- nd to be usually more or less oblong and ovate, but sometimes they are mussel-shaped or even almost trianguar; they vary considerably in size, but each of the larger granules is marked by a number of delicate concentric lines; at the broad or large extremity of each a distinct spot is visible, ordinarily considered to be a cavity, and denominated the "hilum;" this spot is sometimes circular, but most frequently it is seen as a short, sharp line, running transversely across the granule; it furnishes a most distinctive feature by which Maranta arrow-root may be at all times very readily identified.

Fig. 14.



of MARANTA arrow-root, called commonly West India Drawn with the Camera Lucida, and magnified 240 dia-

When boiling water is added to Maranta or any other arrow-root, its physical condition undergoes a great and lteration, the nature of which may be clearly traced by means of the

A table-spoonful of arrow-root, on which a pint of boiling water immediately loses its whiteness and opacity, becomes transparent, re of the water is as it were converted into a thick and jelly-like If a little of this be diffused through cold water, and examined with ope, it will be seen that the starch granules are altered amazingly: ncreased to twenty or thirty times their original volume; they less rounded; the concentric lines and the hilum are obliterated; ne of each granule is ruptured, and a granular matter has escaped erior.

llations which have been bestowed upon Maranta arrow-root are rous; their use ought to be wholly discontinued, for the reasons gned: thus it is sometimes called West India arrow-root, Jamaica, Bermuda, Berbice, St. Vincent arrow-root, &c. The impropriety of denominating it West India arrow-root is shown by the circumstance, Maranta plant is cultivated in the East as well as the West Indies.

The duty on this arrow-root is 2*s.* 6*d.* per cwt.; its price to the pub from 1*s.* to 3*s.* 6*d.* per lb.

Curcuma Arrow-root.

Curcuma arrow-root is obtained from the tubers of *Curcuma angusti* of the family of the *Zingiberaceæ.*

The mode of its preparation does not differ materially from that pr obtaining the fecula from the tubers of Maranta arundinacea, and w already been described.

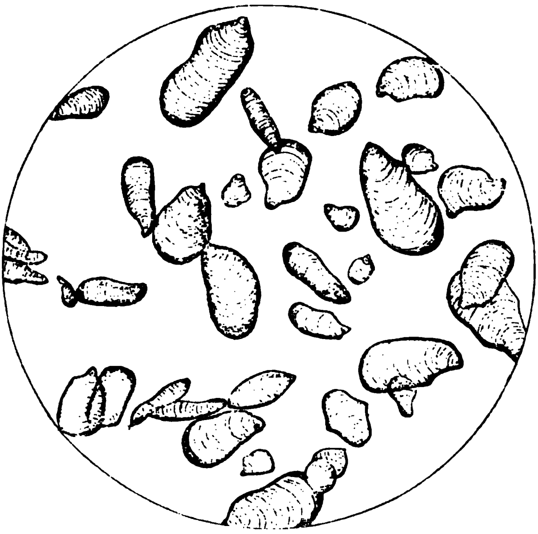
Two qualities of Curcuma arrow-root are imported into this country East Indies, principally from Calcutta, a white and a brown variety.

The white is the best; the powder, when pressed between the fingers, firm, and does not crepitate to the same extent as Maranta arrow-root: species can, however, be distinguished from each other only with cer means of the microscope.

Examined with that instrument, the granules appear elongated, irregularly ovate; being flat, they present but little lateral shading; which mark the surface are tolerably distinct, but they describe seg circles only, hilum, which very indistin sometimes inv placed at the extremity of e nule. In size cles vary con but many of th exceed the la tained in Ma row-root.

Curcuma ar therefore, is guished from arrow-root by and form of the the position of t and the incomp seen on the s the granules, arrow-root is c called East I row-root, the s being sometim to Maranta a cultivated in t and sent to t try; we have thus two distinct species of arrow-root, of different qua value, confounded together under one name.

Fig. 15.



Curcuma arrow-root, commonly denominated East India arrow-root. Drawn with the Camera Lucida, and magnified 240 diameters.

Tacca Arrow-root.

Tacca arrow-root is obtained from the tubers of *Tacca oceanica*, a the South Sea Islands, after the chief of which, Tahiti or Otaheite, it designated.

According to Ellis*, it grows on the high sandy banks near the sea, sides of the lower mountains.

In "Pereira's Elements of Materia Medica" the following account i ration of the fecula: — "At Tahiti this is procured by washing the raping off their outer skin, and then reducing them to a pulp by friction of rasp, made by winding coarse twine (formed of the cocoa-nut fibre) round a board.* The pulp is washed with sea-water through a sieve, he fibrous web which protects the young frond of the cocoa-nut palm. The strained liquor is received in a wooden trough, in which the fecula is deposited; and the supernatant liquor being poured off, the sediment is formed into balls, which are dried in the sun for twelve or twenty-four hours, then broken and reduced to powder, which is spread out in the sun to dry."

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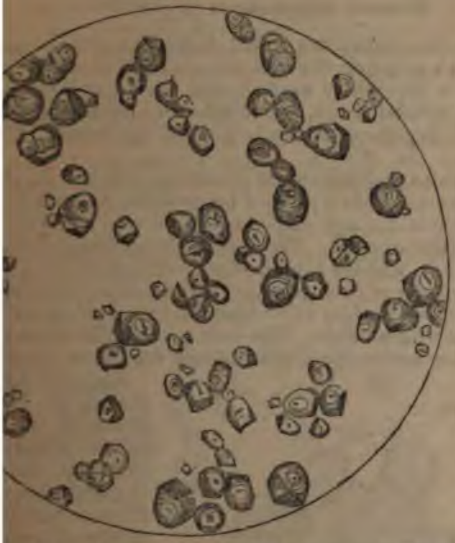
* Polynesian Researches.

Fig. 16.



-root, called usually Tahiti or Otaheite arrow-root. Drawn the Camera Lucida, and magnified 220 diameters.

Tacca arrow-root is a white, starch-like powder, having a slightly musty odour. The granules resemble somewhat those of sago-meal, but are very much smaller; when viewed sideways, they are muller-shaped, with truncate or dihedral bases, and when seen endways they appear circular, and occasionally angular or polyhedral. The rings nd indistinct, and the hilum circular, sometimes fissured in a stellate

rrow-root has been sold in London for some years, in packages, as oot prepared by the native converts of the missionary stations in the Islands." It is sometimes spoken of as "Williams's arrow-root," nissionary of that name.

ghtly musty odour which it usually possesses shows that it is not in prepared with quite the same amount of care as is bestowed on rrow-root.

MANIHOT ARROW-ROOT.

ur or farina of *Manihot utilissima*, the plant which yields "tapioca," nes imported into this country, under the name of "Brazilian arrow-

application of the word arrow-root to the fecula of this plant there objection, since it resembles closely the other arrow-roots in its

cription of *Manihot utilissima*, the Cassava or tapioca plant, and of the which the fecula is first obtained, and subsequently converted into the called tapioca, we shall reserve until we come to treat, in a distinct on "Tapioca and its Adulterations."

t arrow-root, like the other kinds already described, may be distin- y the size, form, and other characters of its constituent granules, which somewhat closely those of Tacca arrow-root, but are considerably

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es that the rind of the root is scraped off by a cowry shell, and the root then grated on a piece smaller, with a larger proportion of granules, which exhibit a circular seen in the field of the microscope: the hilum is usually fissured.

The price of tapioca to the public varies from 6*d.* to 10*d.* the pound greater time and labour are expended in the manufacture of this subst is required for the preparation of the arrow-root, the price of the latte be still less than this.

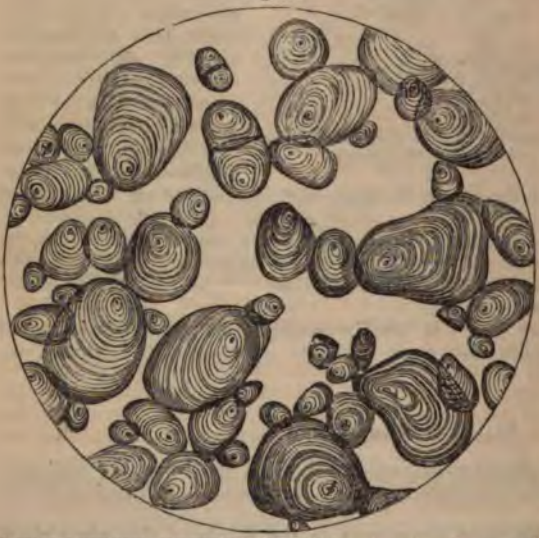
POTATO ARROW-ROOT.

Potato-flour, or arrow-root, sometimes called *British* or *English* ar is prepared by rasping and grinding the well-cleansed tubers of *Sola rosum* into a pulp. This is repeatedly washed, and the water straine a sieve, which retains the cellular tissue, and allows the starch to pass After a time, the starch is deposited at the bottom of the vessel, is washed, and finally dried.

Potato-starch forms a white and somewhat glistening powder, whicl like genuine Maranta arrow-root when pressed between the fingers.

The granules vary greatly in size and shape: some are very small an others large, ovate, or oyster-shaped. The larger granules exhibit very distinct concentric rings, and the hilum, which is small, but well situated in the narrow extremity of each granule: not unfrequently gra be observed of an oval form, divided by a fine line into two portions or each of which is provided with a hilum. We have noticed the same granule in some of the other arrow-roots, particularly the Tacca speci

Fig. 17.



POTATO arrow-root, commonly called British arrow-root. Drawn with the Camera Lucida, and magnified 240 diameters.

The granule arrow-root di those of the ly described in their lar in their form, number and di of the concen which each gr sents to view.

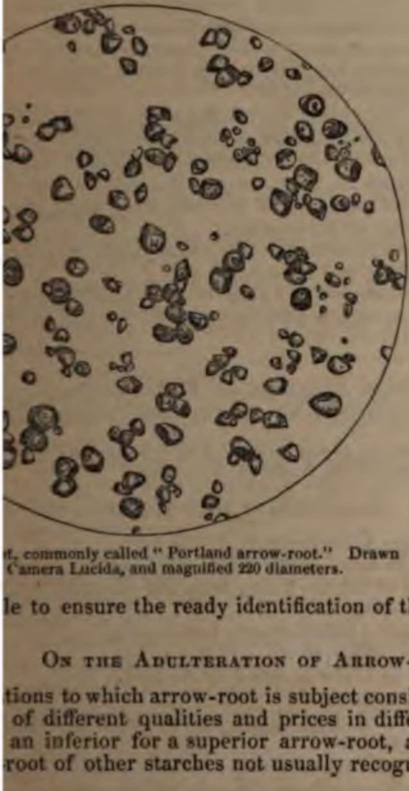
No means which potat root may b guished so sat as by the mi yet it is prope it has been that this sub acted upon b reagents in different from arrow-root: M twice its weig centrated hyd acid, Marant root yields a paste; wher formed with row-root is tr and jelly-like. When boiled with water and sulphuric acid, the latt a peculiar and somewhat disagreeable odour, which is not the case former, when treated in the same munner. Lastly, alcohol extracts fro flour an acrid oil, not contained in the fecula of Maranta plant.

Potato arrow-root is the cheapest of all the starches regarded as arr the retail price varying from 4*d.* to 6*d.* per pound. Although a cheap article of diet, it is of course inferior to Maranta arrow-root.

ARUM ARROW-ROOT.

-root is procured from the tubers of *Arum maculatum*, the common ' "wake robin," and "lords and ladies:" it is prepared chiefly in Portland island; hence it is generally called "Portland arrow-root."

Fig. 18·



t, commonly called "Portland arrow-root." Drawn Camera Lucida, and magnified 220 diameters.

The mode of its preparation is very similar to that adopted with the other arrow-roots: the tubers are pounded in a mortar, the pulp repeatedly washed, and the water subsequently strained. As the tubers are very acrid, great care is required in the washing and straining of this arrow-root, so that the acridity may be completely removed.

The starch granules of arum arrow-root are very small, and, except in size, they resemble very closely those of Tacca arrow-root; but this difference is sufficiently constant le to ensure the ready identification of the two kinds.

ON THE ADULTERATION OF ARROW-ROOT.

tions to which arrow-root is subject consist in the mixing together of different qualities and prices in different proportions, in the an inferior for a superior arrow-root, and in the addition to a -root of other starches not usually recognised as arrow-roots, and

lteration by mixing together Arrow-roots of different Qualities various Proportions.—This most frequently consists in the tato-flour or arrow-root to Maranta arrow-root, the proportion to every variation, the potato-flour in many cases forming the of the article.

s Manihot or tapioca starch or arrow-root is added to Maranta nd in other instances, again, this as well as potato-flour are her.

titution of an Inferior for a Superior Arrow-root.—The fraud of ost commonly practised is the substitution of potato-flour for -root, of which we have met with several instances.

cases, tapioca or Brazilian arrow-root has been substituted for -root; and in others both it and potato-flour have been used.

ulteration by the Addition to a Genuine Arrow-root of other hes not usually recognised as Arrow-root.—The starch usually in the adulteration of arrow-root is sago starch, or meal: indeed nt of potato-flour, which we have included amongst the arrow-nly kind which we have ourselves met with, although it is very in some cases other starches may yet be noticed. Next in otato-flour, sago-meal is the starch most commonly employed, and several samples, declared to be genuine arrow-root, have consisted little else than sago-meal.

As, under the head of " Sago and its Adulterations," we intend to particular description of that article, we shall now only describe the form particles of which sago-meal is constituted.

The starch granules of sago are of considerable size; they are either more usually somewhat muller-shaped, rounded at one extremity, th being truncated or else terminating in a dihedral summit; the hilum is p the larger and rounded part of the granule, is usually surrounded by a ring, and is circular, cracking frequently in a radiate manner. An en of these granules will be given hereafter.

The price of sago to the public varies from 3*d.* to 6*d.*, and is usu per lb.; the cost of sago-meal to the grocer probably does not exceed 2 The dishonesty of substituting such a cheap and inferior farina for arrow-root, which costs from 1*s.* to 3*s.* 6*d.* per lb., is most flagrant.

While foreign arrow-root pays 2*s.* 6*d.* per cwt. duty, sago pays only is, one fifth only of the duty on arrow-root.

A favourite receipt with grocers for the adulteration of arrow-root, of equal parts of potato-flour and sago-meal.

For clearer ideas of the nature and extent of the adulterations of whic root is made the subject, the reader is referred to the following Analyses.

Results of Microscopical Analyses of Fifty Samples of Arr of different Qualities and Prices.

The samples enumerated in the following Table were sold (with the e of the two last) as *Genuine West India Arrow-root.*

Arrow-roots of High Price.

1st Sample.—Purchased in Oxford-street, north side.
Adulterated — with *sago-meal*, which forms the principal portion of th

2nd Sample.—Purchased of Edwin Frost, 288. Oxford-street, south sid
Genuine Maranta Arrow-root.

3rd Sample.—Purchased in Oxford-street, south side.
Adulterated—with *much sago-meal.*

4th Sample.—Purchased in Oxford-street, north side.
Genuine Maranta Arrow-root.

5th Sample.—Purchased of Knight and Sons, 83. Gracechurch-street,
Genuine Maranta Arrow-root.

6th Sample.—Purchased in Drury-lane.
Adulterated—with *much sago-meal* and *some potato-flour.*

7th Sample.—Purchased of Elford, 26. Drury-lane.
Genuine Maranta Arrow-root.

8th Sample.—Purchased in Clare-street.
Adulterated—with *very much sago-meal.*

9th Sample.—Purchased in High-street, St. Giles's.
Consisting entirely of *potato-flour*, *sago-meal*, and *tapioca-starch* particle of Maranta arrow-root.

10th Sample.—Purchased of W. Martin, 6. New Church-street, Edgew
Genuine Maranta Arrow-root.

11th Sample.—Purchased of H. Thorpe, 29. Chapel-street, Edgeware-
Genuine Maranta Arrow-root.

12th Sample.—Purchased in Westminster-road.
Adulterated—with *much potato-flour* and *some sago-meal*, both forming more than half the article.

13th Sample.—Purchased of Farmer and Co., 41. Mount-street, West road.
Genuine Maranta Arrow-root.

14th Sample.—Purchased of Lindsay and Co., 1. Waterloo-road.
Genuine Maranta Arrow-root.

15th Sample.—Purchased in Lower Marsh, Lambeth.
Adulterated—with *potato-flour.*

ple. — Purchased in the Lower Marsh, Lambeth.*

e Maranta arrow-root.

mple. — Purchased of W. Barber and Son, 142. Lower Marsh, beth.

e Maranta arrow-root.

ices of the samples referred to in the above list varied from 1*s.* 8*d.* per lb.

Arrow-roots of Low Price.

ple. — Purchased in Oxford-street, north side, at the same shop as ple, No. 1.

rated — with a great quantity of *sago-meal* and some *potato-flour.*

ple. — Purchased of W. Holland, 127. Oxford-street, north side.

e Maranta arrow-root.

ple. — Purchased of Edwin Frost, 288. Oxford-street, south side.

e Maranta arrow-root.

ple. — Purchased of Hawthorn and Co., High Holborn.

e Maranta arrow-root.

nple. — Purchased of Ashley and Co., 9. High Holborn.

e Maranta arrow-root.

ple. — Purchased of Dakin and Co., No. 1. St. Paul's Churchyard.

e Maranta arrow-root.

ple. — Purchased in Aldgate.

rated — consisting principally of *potato-flour*, with a good quantity of *ca* starch, and some *sago-meal ;* only a few granules of Maranta arrow- to be seen.

ple. — Purchased in High-street, Whitechapel.

rated — with *potato-flour*, which forms about a third of the article.

ple. — Purchased of Sampson, Drury-lane.

e Maranta arrow-root.

ple. — Purchased of C. Belchem, 120. Drury-lane.

e Maranta arrow-root.

ple. — Purchased of Hall, Drury-lane.

e Maranta arrow-root.

ple. — Purchased of Quintrell, 114. Drury-lane.

e Maranta arrow-root.

ple. — Purchased in Clare-market.

ts of *potato-flour* and *sago-meal*, in nearly equal proportions, with cely a particle of Maranta arrow-root.

ple. — Purchased in Clare-market.

ts entirely of *potato-flour.*

ple. — Purchased of White and Fairchild, Blackmoor-street, Clare-ket.

e Maranta arrow-root.

ple. — Purchased of W. Barber, 142. Lower Marsh, Lambeth.

e Maranta arrow-root.

ple. — Purchased in Tottenham-court-road.

rated — with *much sago-meal* and some *potato-flour*, both together ing nearly the whole of the article.

ple. — Purchased of Palmer, 1. Broad-street, Bloomsbury.

e Maranta arrow-root.

ple. — Purchased of Hy. Thorpe, 29. Chapel-street, Edgeware-road.

e Maranta arrow-root.

ple. — Purchased in Edgeware-road.

rated — with *much sago-meal.*

ple. — Purchased in Broad-street, Bloomsbury.

rated — with *potato-flour.*

ple. — Purchased in High-street, Bloomsbury.

ts entirely of *potato-flour.*

e is omitted in this case, because, of two other samples of arrow-root purchased at the same t, one was found to be adulterated with tapioca-starch.

40th Sample. — Purchased of W. Harper, 24. James-street, Lisson-grove.
Genuine Maranta arrow-root.
41st Sample. — Purchased in Tottenham-court-road.
Adulterated — with *potato-flour.*
42nd Sample. — Purchased of N. Hall and Co., Edgeware-road.
Genuine Maranta arrow-root.
43rd Sample. — Purchased in New Church-street, Portman-market.
Adulterated — with *sago-meal.*
44th Sample. — Purchased of Hawthorn and Co., Tottenham-court-road.
Genuine Maranta arrow-root.
45th Sample. — Purchased of Clark, Tottenham-court-road.
Genuine Maranta arrow-root.

The prices of the samples referred to in the second division of the Ta varied from 1*s.* to 1*s.* 6*d.* the lb., the greater part being sold at the former pri but when retailed in ounces the 1*s.* arrow-root was sold at 1*s.* 4*d.* the lb.

We have now to give the analyses of certain samples of arrow-roots, sold eit in lb. canisters, or in packages, these bearing upon the wrappers in which t are inclosed the names of the proprietors, the title of the arrow-root, a warra of its freedom from adulteration, and certain notices or advertisements setti forth that the articles in question were superior, and possessed of unusual q lities and advantages, thus challenging observation and scrutiny. We theref consider that we should not be discharging our duty to the public were w these cases to withhold the names.

Tradesmen now resort to the press extensively. They are authors and puf on an extensive scale; witness the numerous handbills, circulars, and adv tisements, used to announce the various articles of food and drink. It is right, therefore, that the press should make an exposure of the adulterati perpetrated, and thus supply the antidote as well as the bane.

In ordinary cases, when the articles have been purchased without there hav been any attempts to force them into notice by puffs or advertisements, the na of the dealers are not given, in conformity with the intimation contained in first article, on coffee.

46th Sample. — Purchased of Henry Dolamore, Tea and Coffee Merch 32. Westminster-bridge-road.

The following announcement or advertisement is copied from the wrapper

" Superfine West India
ARROW-ROOT,
Warranted Genuine,
1*s.* THE POUND CANISTER.
To be procured only of
Henry Dolomore.

" The attention of FAMILIES and INVALIDS is particularly directed to a Tri the above article, being of the finest quality ever imported into this country."

Adulterated — with a *considerable proportion of potato-flour.*

47th Sample. — Purchased of Westbrook and Company, Italian and Fa Grocery Warehouse, 21. Oxford-street.

" West India
ARROW-ROOT,
1*s.*
per lb.
(With Tin Canister.) "

Adulterated — with *very much potato-flour* and *sago-meal.*

48th Sample. — Purchased in lb. canister, price 1*s.*, of N. S. Hart, Tea Italian Warehouse, 21. Holborn-hill, opposite Furnival's-inn.

" Genuine
West India Arrow-root.
mended by the Faculty as the most Nourishing of all Food for Child
and Invalids."

ed — consisting *almost entirely* of *tapioca-starch*, with a few gran nta or West India arrow-root only.

9*th Sample.*—Purchased of T. Horne, Importer and Dealer in Teas, Coffees, Spices, &c., No. 124. Edgware-road, opposite Harrow-road, in packages, 1*s.* the lb., 6*d.* the half-lb.

"Fine West India Arrow-root,
Warranted free from adulteration."

Adulterated — with *much potato-flour.*

50*th Sample.*—Purchased of Marshall, 17. Adams-row, Hampstead-road.

"Walker's
ARROW-ROOT.
Sold in packages, 2*d.* the quarter lb."

Consists entirely of potato-flour.

51*st Sample.*—Purchased of Milton, Drury-lane.

"Edwards's
ARROW-ROOT.
In quarter lb. packages, price 2*d.*
Sold wholesale by Edwards, Brothers, Albion Steam Mills, 233, 234. Blackfriars-road."

Consists entirely of potato-flour.

We have already stated that the retail price of potato-flour varies from 4*d.* to 6*d.* per lb., the articles denominated Walker's and Edwards's arrow-root are therefore sold to the public at an advance of from 25 to 50 per cent.; and this advance is inevitable on all articles sold by agency or commission, because the agents as well as the proprietors require a profit.

We now distinctly state, that we do not charge the adulterations which we have brought to light upon the retail dealers, as it is possible that they themselves have, in some instances, been deceived by other parties.

It will be observed that we have not indicated any differences in the qualities of the articles above enumerated; our object has been rather to discriminate between the *genuine* and the *adulterated* article, and to draw a broad line of distinction between the two. It is remarkable, however, that while the retail price of Maranta arrow-root, known commonly as West Indian arrow-root, varies from 1*s.* to 3*s.* 6*d.* the pound, no corresponding differences could be detected in the appearance and characters of the various samples; in some instances, *but not always*, the lower-priced samples were less white, and, examined with the microscope, occasionally presented a few irregular fragments, consisting probably of the cellular tissue of the rhizome of the Maranta plant, and some of the granules themselves appeared rough and eroded: these differences indicate less careful preparation, but not being constant or considerable, they seemed to us to be insufficient to account satisfactorily for the variation in price to which this article is subject, and we are led to suspect that this variation is not regulated by any fixed or accurate data, but is arbitrarily determined. In two or three samples of arrow-root we noticed a very few sporules and threads of the thallus of a fungus.

In our report on Coffee, we advised the public not to purchase that article in canisters, because with each separate pound of coffee so purchased a canister would have to be paid for, and because, as the grocer professes to sell the coffee contained in cases at the same price as he would charge for the same quality of coffee wrapped up in paper only, and as he must realise a profit, the canisters operate as an inducement to increased adulteration. We must here repeat the same advice with respect to the purchase of arrow-root in cases or packages; for this article they are less necessary than for coffee, since arrow-root possesses no aroma, the loss of which would be attended with injury to its condition.

The price of a pound tin canister is not less than from 2½*d.* to 3*d.*, thus increasing the cost of a shilling article twenty-five per cent.

We will now proceed to examine more particularly the results to be deduced from the Table of Analyses.

It appears then —

1st. That out of the *fifty* samples of arrow-root submitted to analysis, *twenty-two were adulterated.*

2nd. That in *sixteen* samples the adulteration consisted in the addition of single article, much cheaper in price, and very inferior in quality, genuine arrow-root, this, in ten instances, being *potato-flour ;* in five, *sag meal ;* and in one case *tapioca-starch*.

3rd. That in *five* samples it consisted in the employment of two differe articles, *potato-flour* and *sago-meal.*

4th. That in *two* instances three different starches were employed in the adu teration —viz., *potato-flour*, *sago-meal*, and *tapioca-starch* or fecula.

5th. That *ten* of the arrow-roots *contained scarcely a particle of genu Maranta or West Indian arrow-root*, for which they were sold. O consisted almost entirely of *sago-meal ; two* of *potato-flour* and *sago-mea two* of *potato-flour*, *sago-meal*, and *tapioca-starch ; one* of *tapioca-starc* and *four* were composed entirely of *potato arrow-root* or starch.

The above comprehend the chief results deducible from the Table of Analyse one or two others, however, still remain to be noticed.

It is somewhat remarkable, that not one of the fifty samples examined co tained a particle of Curcuma or East India, Tacca or Tahiti, Arum or Portlan arrow-root—a result, especially as regards Curcuma arrow-root, scarcely a ticipated, and which shows how little of these three kinds of arrow-root fi their way into the market.

Again, where two arrow-roots, a high and low-priced, were purchased at t same establishment, it was curious to observe that *both were either genuine both adulterated.*

It thus appears, that in the useful article arrow-root, the public is exte sively defrauded of its money, and the revenue of its income.

Against practices so gross and dishonest as those which we have exposed this Report, it behoves every honest tradesman to set his face ; or the time w come—in fact it has already in part done so—when the honest trader will ha to suffer for the wrong-doings of the dishonest, and when the whole trade grocers will be looked upon by the public with the greatest mistrust.

Since the above report was written, the duty on arrow-root has been reduced it is now only 4½*d.* per cwt., whether from a foreign or British possessio being the same duty as is now paid on all kinds of flour and meal.

PEPPER, AND ITS ADULTERATIONS.

The natural family *Piperaceæ* includes four plants of great utility to mankind two of these, *Piper nigrum*, or black pepper, and *Piper longum*, more recentl named *Chavica Roxburghii*, or long pepper, are chiefly employed for dieteti and culinary purposes ; whilst the others, *Piper Cubeba*, now *Cubeba officinali* and *Artanthe elongata*, or the matico plant, are principally employed in medicin

The plant which yields cayenne, *Capsicum annuum*, often improperly terme cayenne pepper, does not belong to the family of *Piperaceæ* at all, but to that *Solenaceæ.*

The pepper of commerce is furnished by Piper nigrum, and it is to this specie therefore, that on the present occasion we shall have to direct attention.

The black pepper plant grows both in the East and West Indies, in Sumatr Java, and other islands ; it is a shrubby, climbing plant, which attains the heig of from eight to twelve feet. The berries, or peppercorns, grow on terminal flowe stalks or spadices ; they are at first green, but change subsequently to red a then to black. When any of the berries on a spadix have begun to turn re the whole are gathered, dried in the sun, and the stalks separated by the han In drying, the succulent part of each berry becomes contracted and wrinkle forming a hardened wrinkled cortex ; the corrugations being much raised, a describing a kind of elevated network.

The following more detailed particulars concerning the growth of the pepp plant and the gathering of the berries are extracted from M'Culloch's "Di tionary of Commerce."

"It climbs to the height of twenty feet, but is said to bear best when restrain to the height of twelve feet. It begins to produce at about the third year, a

fection at the seventh; continues in this state for three or four years,
ines for about as many more, until it ceases to be worth keeping. The
ws abundantly from all its branches, in long, small clusters of from
to fifty grains; when ripe it is of a bright red colour. After being
it is spread on mats in the sun, when it loses its red colour, and becomes
d shrivelled as we see it. The grains are separated from the stalks by
bbing. That which has been gathered at the proper period shrivels the
ut if plucked too soon, it will become broken and dusty in its removal
ce to place. The vine produces two crops in the year, but the seasons
ect to great irregularities."

berries are the best which are not too small nor too much corrugated;
e heavy, and sink readily in water.

wo varieties of pepper known as "black" and "white" pepper are both
from the same plant: black ground pepper is the entire berry reduced
er, while the white consists of the same berry, decorticated or deprived
ter and black husk or covering.

arn from Periera that three kinds of *black pepper* are distinguished by
le dealers. These are:—

labar pepper.—This is the most valuable; it is *brownish-black*, free from
nd nearly free from dust."

ang pepper.—This is *brownish-black*, larger, smoother, free from stalks,
dusty. It is sometimes used in England to manufacture white pepper."

atra pepper.—This is the cheapest sort; it is *black*, mixed with stalks,
tains much dust. Under the name of Sumatra pepper, some dealers
the Penang or brownish-black sort, and the black Sumatra sort."

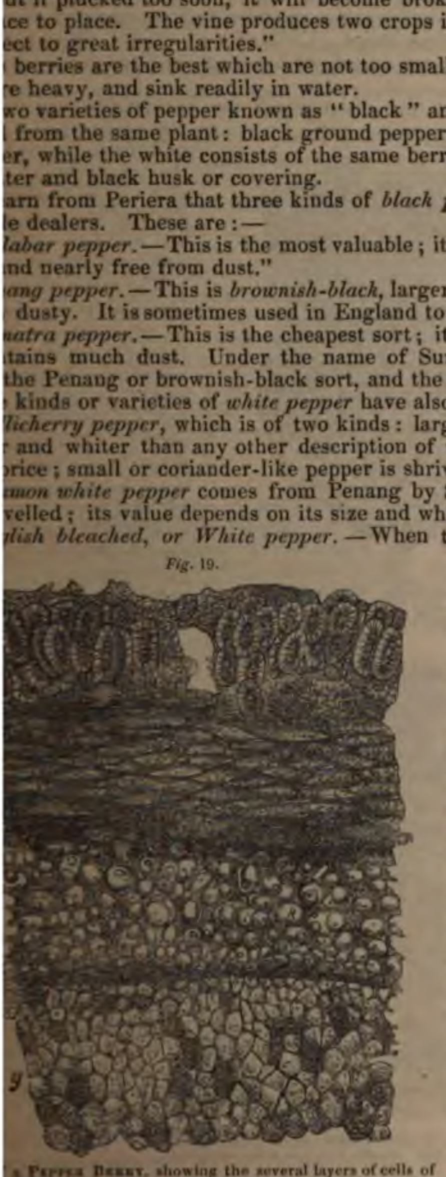
kinds or varieties of *white pepper* have also been distinguished.

licherry pepper, which is of two kinds: large or fine Tellicherry pepper
and whiter than any other description of white pepper, and fetches a
rice; small or coriander-like pepper is shrivelled."

mon white pepper comes from Penang by Singapore; it is round, and
velled; its value depends on its size and whiteness."

lish bleached, or White pepper.—When the two preceding sorts are scarce, brown Penang pepper is bleached. The yellowest and largest grains are chosen for this purpose, for neither an expensive nor small sort would pay."

Fig. 19.



a PEPPER BERRY, showing the several layers of cells of
e *cortical part* is constituted, and the junction of this with
ral portion, *c*. Drawn with the Camera Lucida, and
d 60 diameters.

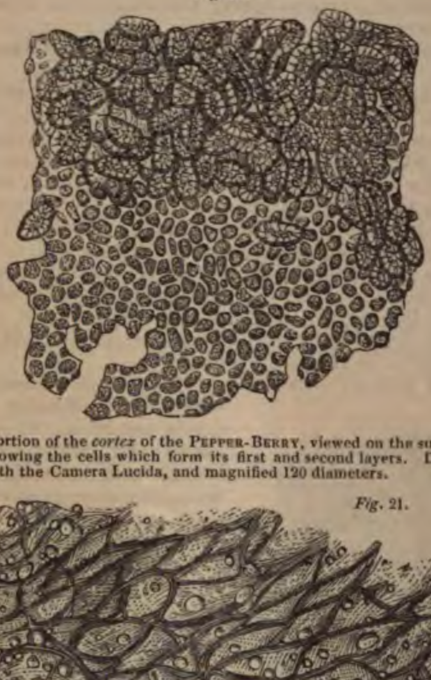
Structure of the Berry.—The berry of the black pepper plant possesses a structure of considerable complication, and of much interest; and since without an accurate knowledge of its minute organisation we cannot hope to be in a position to detect the numerous adulterations to which this article is subject, it becomes necessary to describe somewhat minutely the tissues which enter into its formation.

In a section of the berry, two parts are to be distinguished—an outer and an inner: the first is black, or reddish-black; and the second more or less white, hard, and brittle, except in the centre of the seed, where it is frequently soft and pulverulent.

When a thin vertical section of the outer or cortical part of the
examined, by means of the microscope, it is seen to be composed o
distinct parts, each of which is constituted of one or more layers of cell
a section is represented in *fig.* 19.

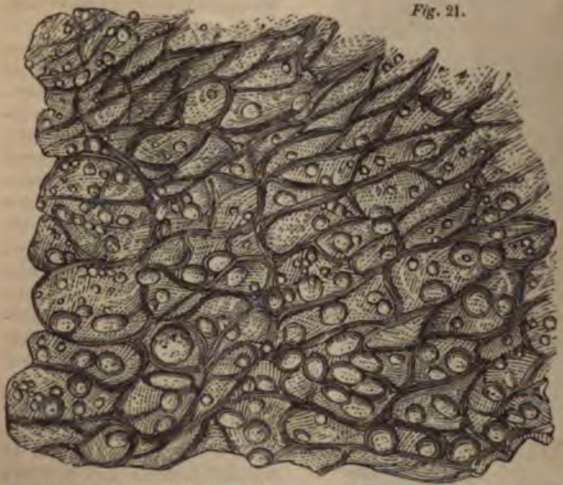
The external part of the berry, marked *a* in the preceding figure, is co
of cells of an elongated form, placed vertically. These cells are provid
central cavity, from which lines, probably minute canals or channels
towards the circumference; when viewed sideways, they appear rat
than twice as long as broad; and when seen endways, they appear most
shape, and but little longer than broad. Cells of a somewhat similar
are described in the Report on Sugar, as entering into the formatio
epidermis of the sugar-cane.

Fig. 20.



A portion of the *cortex* of the PEPPER-BERRY, viewed on the surface, showing the cells which form its first and second layers. Drawn with the Camera Lucida, and magnified 120 diameters.

Fig. 21.



A portion of the *fourth lamina* of the cortex of PEPPER BERRY, showing the oil contained in the cavities of the cells. Drawn with the Camera Lucida, and magnified 120 diameters.

The cells next in order, and upon which the previously descri
rest, are small,
and dark colou
the engraving);
sition is indicate
the first woodcut,
as well as the
cells, are shown i

The small angu
just noticed, do n
to separate read
the cells which o
mediately beneat
and of which they
bably mere modif
strictly speaking
fore, they ough
considered as forn
of the layer ne
described, and
spoken of them s
only for conven
reference and des

The cells
described ar
three times
than those pr
noticed, a
numerous,
about half t
ness of the
they are all
less coloured
colour deepe
cells appro
next layer.
sition of thi
layer is poi
at *b*, *fig.* 19
third layer
thin, and is c
of woody fib
dles of spira
of small si
formed of
threads, *fig.*

The jun
the second
third layer is
out by a dark line situated about the middle of the cortex; see *fig.* 19,

rth layer is composed of numerous large cells, and it constitutes the rt of the remaining half of the cortex (*fig.* 19. *d*). As the cells approach l part of the berry, they become much modified, two or three times nd of a deep red colour (*fig.* 19. *e*); these cells might be described as fifth and distinct layer.

nerous cells which form the fourth layer contain a very great abun- oil-globules, and it is in it that the essential oil of the pepper-berry ocated.

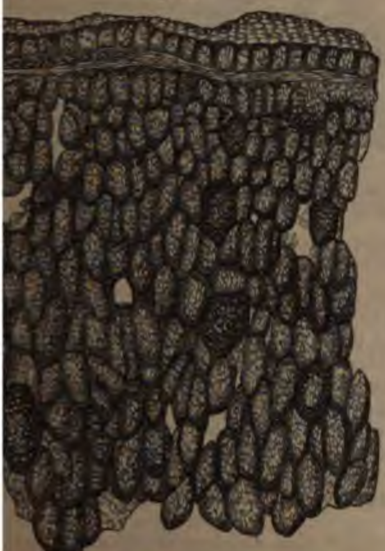
s which form the fifth and last tissue which enters into the composi- cortex of the pepper-berry are divisible into two or three layers, the oloured, and the inner invariably colourless; the colourless cells pre- iculated appearance, forming a transparent lamina which frequently as a distinct tissue. *Fig.* 19. *f.*

tral part of the berry or seed is constituted of cells of large size and ape; they are about twice as long as broad, and disposed in a radiate n the outer part of the seed they are adherent, hard, and stonelike, ie centre they are readily separable, and often form a powder resem- . *Fig.* 19. *g*, and *Fig.* 22.

ie pepper-berry is macerated in water for some hours, the cortical ently separates without difficulty from the seed proper; if, however, e the surface of this closely, we observe that it is of a reddish colour, mes evident that a portion of the cortex is still adherent, this consist- of the fourth layer, containing much of the oil and the fifth layer.

ecomes apparent that the terms in common use, "white pepper," rticated pepper," are not altogether correct, for the berry is not en- ded of the cortex, nor is its powder white, for if a little of it be diffused ter on a slip of glass, reddish particles immediately become visible: these are fragments of that portion of the cortex, which remains firmly adherent to the seed itself.

Fig. 22.



central portion of the PEPPER-BERRY, showing the cells of which it is composed, the colourless and co- and also its junction with the cortex. Drawn with Lucida, and magnified 120 diameters.

When sections of the inner part of the pepper-berry are immersed in water for a short time, they assume a yellowish or canary tint, and when examined with the microscope, the colour is seen to be confined to certain of the cells only, of which the sections are composed; these cells are rather larger than the ordinary cells; they are placed at tolerably regular distances from each other, and they reflect a deep yellow colour. In recent sections which have not been immersed in water, the cells, which afterwards become yellow, may be distinguished by a darker shading, and sometimes by a faint tint of colour. The deepening of colour is determined by the action of the salts contained in water tents of these cells, which differ chemically from those of the ordi-

these coloured cells that the piperine chiefly, if not exclusively, is lcohol and nitric acid deepen the tint very greatly, and on the application of concentrated sulphuric acid to dry sections of the pepper-berry, they become of a reddish hue, the change of colour being limited, in the first instance, to the peculiar cells in question. These results of the use of the above re-agents are such as ensue with piperine itself.

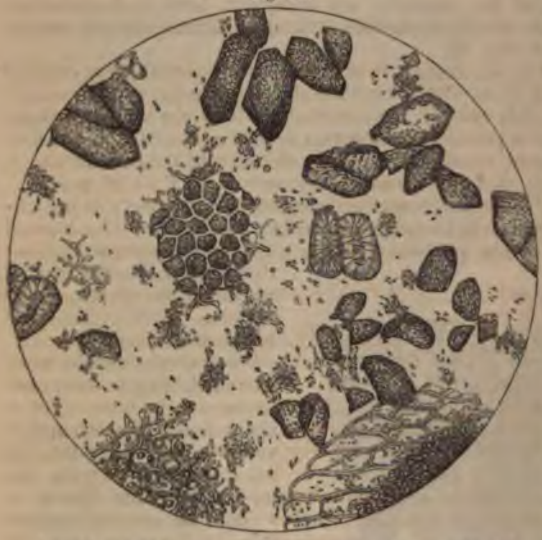
The structure of the central part of the pepper-berry, and the position and character of the coloured cells, are shown in *fig.* 22.

Now, in ground black pepper, all the structures which we have described may be traced out in a broken and fragmentary condition, but in white pepper certain of these tissues only exist—viz., a part of the fourth layer of cells, which contains the oil, and the fifth cellular lamina.

Before the observer is in a position to detect the adulterations of pepper, it is necessary that he should well understand the appearances and structure of ground pepper, both black and white.

When black pepper is diffused through water, little particles of three different kinds, intermixed with a fine powdery substance, are visible; some of these are black, others reddish, and the last white; the black are fragments of the outer, and the red those of the inner cortex, while the white are the pulverised seed itself. The white powder is formed of the cells of the seed, some united in twos and threes, but the majority either separate and entire, or broken into pieces: these cells contain starch-granules of extreme minuteness. The engraving (*fig.* 23.) will serve to convey a good idea of the appearances presented under the microscope by ground and unadulterated black pepper.

Fig. 23.



Ground and unadulterated BLACK PEPPER. Drawn with the Camera Lucida, and magnified 120 diameters.

In the black particles but little evidence of structure is in general to be seen, and where doubt is entertained of their nature, it is necessary that they should be first bleached with chlorine, torn into pieces with needles, and then examined with the microscope.

In genuine white pepper no black fragments ought to be seen, but numerous reddish-brown particles are always present, usually adherent to the white cells which form the central part of the berry.

These white cells, when separated from each other, whether entire or broken, being of angular form, very hard, and reflecting deep shadows, bear a strong resemblance to particles of stone or grit, for which they would be very apt to be mistaken by persons unacquainted with the microscopic structure of the pepper-berry.

The cavities of these cells are filled with starch-granules of exceeding minuteness, and, as in ground pepper, many of the cells are broken into pieces, some of the granules become effused; these are so very small that they are generally in a state of molecular movement, and they resemble spherules of oil rather than starch-granules. No other starch-grains exist in the pepper-berry besides those just described.

So great is the quantity of starch contained in the seed or central part of the berry, that the cells when touched with a solution of iodine become deep blue, the yellow cells being affected in the same manner, but more tardily and to less extent.

The active properties of black pepper depend upon an acrid resin, a volatile oil, and a crystallisable substance called piperine, which exists also in long pepper, and in cubebs; the resin is situated chiefly in the outer part of the cortex, the volatile oil in the inner part or fourth layer, and the piperine in the yellow cells of the seed itself.

ON THE ADULTERATION OF PEPPER.

It has long been notorious that pepper is one of those articles most liable to adulteration; notwithstanding which fact, and the importance of the subject in a fiscal point of view, but little has hitherto been effected in bringing to light the nature of the sophistications practised, and more particularly in describing the methods of their detection. Of statements indeed we have several, but of either proofs or directions scarcely any worthy of notice or entitled to confidence.

In support of these assertions, we proceed to make reference to the more important as well as recent authorities on the subject of the adulteration of food.

Thus in the "Supplement" to Dr. Ure's "Dictionary of Arts, Manufactures, and Mines," we do not meet with any information respecting the adulteration of pepper worth quoting.

In M'Culloch's "Commercial Dictionary" we observe the solitary remark, "Black pepper, sold ground, is said to be adulterated with burnt crust of bread."

In Mitchell's "Treatise on the Falsification of Food," under the head "Pepper and its Adulterations," we find the following observations:—

"In the state of powder, pepper is nearly always adulterated, substances being sold for the express purpose. It is often mixed with powdered husks of mustard, which are openly sold for this purpose, as is also the sweepings from the pepper warehouses, under the name of P. D. or pepper-dust; and yet an inferior kind of this adulteration is sold under the name of D. P. D., signifying the dust, or dirt of pepper-dust."

No directions, be it observed, are given for the detection of the adulterations referred to in the above quotation.

Normandy, in his "Commercial Handbook of Chemical Analysis," remarks, "Both *black* and *white pepper*, when ground, are very often adulterated, and sometimes in an extraordinary degree, with ground *oil-cake*, *linseed-meal*, and other like substances. The best way of providing against adulteration is, like that for coffee, to buy the article in the grain, and to examine whether it has the appearance which we have described above, and which is the criterion of a good quality." And in a subsequent paragraph he writes, "For the purpose of ascertaining whether ground pepper is genuine and of good quality, the best way consists in ascertaining the amount of piperine contained in the pepper under examination."

Thus here, again, no instructions are given, by which the nature of the adulterations practised in each case may be determined, but we are recommended to ascertain the amount of piperine present, and which, when known, tells us nothing about the adulteration of the article, but simply indicates quality; a pepper may be either good or bad, and accordingly contain much or little piperine, and yet be perfectly "genuine."

Although the work of Mr. Normandy was published in the year 1850, not a syllable is said about the application of the microscope to the detection of the adulterations of pepper.

The last authority to whom we shall refer is Pereira, who, in the description of Piper nigrum as contained in the new edition of his "Materia Medica," and under the head "Adulteration," writes, "Sago is said to have been used to adulterate ground white pepper. The microscope would readily detect the fraud; the starch grains of sago being very much larger than those of pepper, from which they also differ in shape."

The above paragraph comprises the whole that is said by Dr. Pereira on the adulteration of pepper.

We have now to state, that by means of the microscope, applied to the elucidation of structural botany, we have succeeded in detecting, in the most satisfactory and conclusive manner, the adulteration of pepper by not less than five different substances—namely, linseed, mustard-seed, wheat-flour, pea-flour, and ground rice.

Of the adulteration with sago-meal, strange to say, we did not meet with a single instance in the whole of the forty-three samples submitted to examination.

Now we believe that we are correct in stating that the samples of pepper upon which the recent prosecutions and convictions were founded, were adulterated with some form of starch, principally sago-meal; and that in no case were proceedings instituted on the ground of the pepper being admixed with either linseed or mustard-seed, although these are the sophistications most frequently practised. This is probably explained by the difficulty which has hitherto been felt in determining these adulterations in a manner sufficiently conclusive to ensure conviction.

We will now proceed to describe the structure of linseed, and mustard-seed, and also refer briefly to the characteristics of the starch of wheat, the pea, sago, and rice.

Structure of Linseed.—Linseed possesses a very beautiful structure; two coats or tunics enter into the composition of the covering of the seed, and require description.

The outer coat gives the polish to the seed, and is composed of several layers of large and colourless cells, of a rounded or hexagonal form.

It is in the cells which form this tunic that the mucilage which linseed yields so abundantly, on infusion, is contained.

Of this interesting fact a little observation with the microscope furnishes sufficient evidence: thus, in many cases, this instrument does the work of the chemist, and more than the chemist in some cases can effect, even in his own art and science: not to pass beyond the limits of this paper, by means of the microscope we have determined three interesting facts, which may be denominated chemical—the position of the essential oil, and the nature of the contents of the yellow cells of the pepper berry, as well as the tissue in which the mucilage of linseed is located.

The second membrane is that in which the colour of the seed resides: it is composed of narrow, elongated cells, which give it a striated and very characteristic appearance; being firm and strong, it forms the protecting tunic of the seed.

The substance of the seed consists of cells, in the cavities or meshes formed by which the oil and starch granules are enclosed.

The oil is contained principally in the outer or more superficial cells, in the form of brilliant and pearl-like minute drops or spherules.

The starch granules are most abundant in the interior of the grain; they are angular, minute, and two or three times larger than those of the peppercorn.

The very frequent association, in ripe seeds, of oil and starch—both non-nitrogenised substances, resembling each other so closely in chemical composition—suggests the consideration, whether the latter is not, in some cases, and under certain circumstances, convertible into the former. In those seeds, in which, when mature, we do not meet with starch, we usually find oil to be present; and in many of these cases starch grains are actually contained in the unripe seeds or berries.

The whole of the structures above described may be satisfactorily detected by a little patient investigation, in the linseed reduced to powder or meal. The parts, however, most frequently and clearly seen, are fragments of the fibrous coat, and little masses of starch, from the edges of which, portions of the cellulose forming the transparent cells project, in a radiate and very characteristic manner.

To discriminate the cases in which linseed-meal has been employed for the purpose of adulteration, from those in which the seeds from which the oil has been expressed have been used, we apprehend would not be difficult.

Structure of Mustard-seed.—The seed of mustard exhibits a very characteristic organisation, and by means of which, even when it is ground into powder, it may be readily detected.

We shall not at present offer a detailed description of its structure, but will merely notice, in a very brief manner, the chief tissues which enter into its composition.

The external membrane is formed of large, transparent, and mucilaginous cells.

The second tunic is constituted of very minute, angular cells, which contain part of the colouring matter of the seed.

rd coat is likewise composed of angular cells, two or three times larger
of the second investing membrane, and possessing well-defined
hey also enclose colouring matter.

l itself consists principally of cellulose, the cells of which are filled
obules, and contain but few starch-granules.

ers of Wheat-flour.—As we shall hereafter have to describe fully the
nd characters of wheat-flour, it will be sufficient, at present, to say,
ains are rounded, flattened discs, very variable in size, and without
ncentric rings.

rs of Pea-flour.—The principal characters of the starch-granules of
an flour have already been adverted to in the Report on Coffee:
al bodies, with strong lateral shading, provided with a few concentric
exhibiting an elongated central furrow.

rs of Sago-meal.—Sago-meal has likewise been described, in the
Arrow-root. The starch granules of which it is composed are large,
nded at one extremity, and truncate at the other, with a circular
n cracked in a stellate manner, and with but few rings visible.

er-dust.—Pepper-dust, known in the trade as P. D., or H. P. D.,
pepper-dust, consists either of the sweepings of the floors of the
ouses, or of the siftings of the whole pepper-berry.

d to mix with ground pepper, and when composed of pepper-dust
gh a very inferior article, its admixture with pepper cannot be re-
n adulteration.

nce is to be suspected in those peppers which present a dry, earthy
and the powder of which is extremely fine.

f the samples, the results of the examination of which are given in
d table of analyses, presented the above-described characters, and
all probability contained a considerable quantity of H. P. D.

er husks.—The pepper-berries from which white pepper is made,
imported in a decorticated state; sometimes, however, they are
their husks in this country, these being ground up and used for
r.

reason to suspect the presence of an undue quantity of husk when-
presents a darker appearance than ordinary; we have seen several
which there appeared to be a considerable excess of cortex.

ical part of a pepper-berry being firmer and tougher than the
ion, the former in grinding is not reduced to the same state of di-
e latter, but its particles are usually much larger. Of this fact, we
informed, dishonest tradesmen have availed themselves, and by
ng, and thus removing the larger particles of the husk, have contrived
of common black pepper both the black and white kinds.

tious Pepper-berries.—Some years since it was not uncommon to
rtificial peppercorns; instances of their occurrence are mentioned
son's Annals of Chemistry," and also by Accum, in the second
is celebrated "Death in the Pot."

um writes:—"I have examined large packages of both black and
er by order of the Excise, and have found them to contain about
cent. of this artificial compound. This spurious pepper is made of
(the residue of the linseed from which the oil has been pressed),
y, and a portion of cayenne pepper, formed into a mass, and granu-
ng first pressed through a sieve, and then rolled in a cask."

d during which this fraud prevailed was probably confined to the
expired in 1823, when the duty amounted to no less than 2*s.* 6*d.* on
nd of pepper.

THE MICROSCOPICAL ANALYSIS OF FORTY-THREE SAMPLES OF BLACK AND WHITE PEPPER IN POWDER.

wing samples were purchased previous to the recent Government
and convictions:—

Black Peppers.

—Purchased in Oxford Street.
rated, but containing much fine pepper-dust.

2nd Sample.—Purchased in High Holborn.
Unadulterated, but containing a large excess of husk.
3rd Sample.—Purchased in New Church-street, Portman-market.
Unadulterated.
4th Sample.—Purchased in High-street, Marylebone.
Unadulterated.
5th Sample.—Purchased in Tottenham-court-road.
Adulterated—with *much linseed-meal* and *wheat-flour.*
6th Sample.—Purchased in James-street, Lisson-grove.
Adulterated—with *mustard husk or seed.*
7th Sample.—Purchased in Tottenham-court-road.
Unadulterated.
8th Sample—Purchased in Drury-lane.
Adulterated—with *much pea-flour.*
9th Sample.—Purchased in Clare-market.
Unadulterated.
10th Sample.—Purchased in Oxford-street.
Adulterated—with *much wheat-flour.*
11th Sample.—Purchased in Kensington.
Adulterated—with *much linseed-meal.*
12th Sample.—Purchased in Edgeware-road.
Adulterated—with *much linseed-meal.*

White Peppers.

13th Sample.—Purchased in Oxford-street
Adulterated—containing a considerable quantity of *ground rice.*
14th Sample.—Purchased in New Bond-street.
Unadulterated.

The following samples were purchased subsequent to the Governme
cutions and convictions:—

Black Peppers.

15th Sample.—Purchased in Lower Marsh, Lambeth.
Unadulterated.
16th Sample.—Purchased in New-cut, Lambeth.
Unadulterated, but dry and earthy-looking, from the great quantity o
dust contained in it.
17th Sample.—Purchased in Westminster-road.
Adulterated—containing a small quantity of *pea-flour.*
18th Sample.—Purchased in Lambeth Marsh.
Unadulterated.
19th Sample.—Purchased in Westminster-bridge-road.
Unadulterated.
20th Sample.—Purchased of Henry Dolomore, Tea and Coffee M
32. Westminster-bridge-road.*
Unadulterated.
(Noticed in a previous Report as a vendor of *adulterated arrow-root.*
21st Sample.—Purchased in Lambeth Marsh.
Adulterated—containing a considerable quantity of *ground rice.*
22nd Sample.—Purchased in Waterloo-road.
Unadulterated, but rather earthy-looking.
23rd Sample.—Purchased in New-cut, Lambeth.
Unadulterated.
24th Sample.—Purchased in White-cross-street.
Adulterated—with *mustard-seed.*
25th Sample.—Purchased in King-street, Snow-hill.
Unadulterated.
26th Sample.—Purchased in Whitecross-street.
Adulterated—with *mustard-seed.*
27th Sample.—Purchased in Snow-hill.
Unadulterated.

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* As an act of justice we publish the names of Mr. Dolomore and two others, as the vendor
terated pepper, because they were in a former Report mentioned as the sellers of *adulterated* arr

mple.—Purchased in Barbican.
ulterated.
mple.—Purchased in Holborn.
ulterated.
mple.—Purchased at Notting-hill.
ulterated, but contains much dust, which gives it a dry, earthy appear-
e.
mple.—Purchased in Chapel-street, Somers-town.
ulterated.
mple.—Purchased in Skinner-street, St. Pancras.
ulterated.
mple.—Purchased in Edgeware Road.
terated—with *mustard-seed.*

White Peppers.

mple.—Purchased in Holborn.
ulterated.
mple.—Purchased of N. S. Hart, Tea and Italian Warehouse, 21.
lborn-hill, opposite Furnival's Inn.
ulterated.
ced in a former Report as a vendor of *adulterated arrow-root.*)
mple.—Purchased in Holborn.
ulterated.
mple.—Purchased in Blackfriars road.
terated—with *much linseed-meal.*
mple.—Purchased in King-street, Snow-hill.
ulterated.
mple.—Purchased in Barbican.
ulterated.
mple.—Purchased near Battle-bridge.
ulterated.
mple.—Purchased in White-cross-street.
ulterated.
ample.—Purchased of Westbrook & Company, Italian and Family
cery Warehouse, 21. Oxford-street.
ulterated.
ced in a former Report as a vendor of *adulterated arrow-root.*)

uture period, as we have already promised, the *names* and *addresses* of radesmen from whom the purchases are made will be *regularly published.* ive the name in the following case, for the same reasons that we pub- in the Report on arrow-root, the names of those parties who were found n adulterated article, and who had recourse to the press, in the shape of d advertisements, to make it known, and so obtain the confidence of ic.

ample.—Purchased of Wm. Bowley, Oilman and Tallow-chandler,
. Tottenham-court-road.
in packages, price 1*d.*, and from the wrapper of which the following is
—

"*Finest*
WHITE PEPPER.

package of this article, which is the interior part of the kernel of the pper, being equal in strength to nearly three times the quantity of black (which is the inferior small shrivelled berries, and often little more than it will be not only the best but the cheapest for every purpose."

terated—consisting of finely ground *black pepper*, and a *very large ntity of wheat-flour.*

package submitted to examination by us, and which is now in our pos- was one of a large pile placed upon the counter, the attention of the er being particularly directed to the article as one of great superiority oubted purity, the proprietor or shopman, in order to inspire his customers with confidence, remarking, "We have had 'em here; we have had Excise chaps here, but they could do nothing with us."

On an examination of the preceding Table it appears—

First, that *more than half of the peppers purchased previous to the re convictions were adulterated.*

Second, that *a much less, although still a considerable proportion of samples procured subsequent to those convictions were likewise adulterated.*

It cannot therefore be doubted, but that the recent enforcement of the la the Excise authorities has exercised a salutary effect, and that it has chec partially at least, and for a time, the scandalous practices so extensively reso to in the adulteration of pepper.

When, however, the paucity of the convictions—some five or six only,— the number of those traders who sell pepper, amounting to not less than e or ten thousand, as well as the rarity of Excise interference, are considered, to be feared that the little good thus effected will be but of brief duration, that very shortly the public revenue will be plundered as before, unless, ind through the operation of the Analytical Sanitary Commission, the good ef of which have already been extensively felt.

The present duty on pepper is 6*d*. per pound, and 5 per cent. thereon, w yielded, for the year 1850, no less than 85,526*l*. 8*s*. 1*d*. We thus perceive great is the interest of the Government to prevent the adulteration of this ar by which thousands are lost to the Exchequer annually.

The sum of 85,526*l*. 8*s*., reduced to sixpences, gives the number of poun pepper consumed in the year 1850—viz., 1,710,536 pounds.

M'Culloch estimates the quantity of pepper retained for consumption i year 1842, at 2,679,624 pounds, and the income derived from the duty at 70,348*l*. 3*s*. 4*d*. These two statements it is impossible to reconcile, f correct, upwards of 1,000,000 pounds must have escaped the duty altogeth

There were entered for home consumption, in the year 1852, 3,524,50 in 1853, 3,461,333 lbs.; and in the first six months of 1854, 1,656,721 lbs.

We believe, that were the duty on pepper still further reduced, the re would be found to suffer scarcely at all, and that the increased consun and lessened inducement to adulteration which would exist, would cau sum fully to equal, if it did not exceed, the present amount.

WATER, AND ITS IMPURITIES.

As the time is fast approaching when the great question of the Water of London will again be brought under the notice of the public and of parli we propose to place before the reader, in a clear and concise manner, the of the facts connected with a subject of such vast social importance.

We shall discuss it under four heads or sections. Under the first hea impurities of water will be considered; under the second, the different ki water will be treated of; under the third, the present sources of supply examined; and under the fourth, a detailed examination will be given of th posal of the General Board of Health for the supply of water to the metro

SECTION I.

THE IMPURITIES OF WATER.

The various contaminations to which water is liable may all be arr under two heads; they are either *organic* or *inorganic*.

Organic Impurities.

The organic impurities again naturally resolve themselves into the *dea* the *living*.

Dead Organic Impurities.—Inasmuch as the dead organic subs

n impure waters form the material or food upon which the living im-
re sustained, it is proper to allude first to them.

ad organic contaminations again admit of still further division into
ived from the vegetable kingdom, or *dead vegetable impurities*, and those
nimal kingdom, or *dead animal impurities*.

Vegetable Impurities.—The dead vegetable substances very frequently
n impure water are water-plants, leaves, and other fragments of land
hich find their way into it in a variety of ways, and particularly at the
the fall of the leaf.

lead vegetable tissues are in a state of continual decay and change;
of life, they become subject to the action of the laws of chemical
y which their structure is speedily destroyed, and their whole fabric
nto substances of more simple forms and constitution, as *carbonic acid*,
d hydrogen, *ammonia*, sometimes *sulphuretted hydrogen*, as well as
in some cases, other bodies of more subtle nature, the characters of
e not hitherto been determined.

nimal Impurities.—The dead animal organic impurities present are
of infusoria, annelidæ, insects, fish, and animals, as well as the soluble
ompounds, as albumen, gelatine, mucus, &c., derived from and dis-
of these by the water.

everal animal substances and compounds are likewise in a state of
hange; their elements, obedient to the laws of chemical action, become
, and form combinations more simple, as *ammonia*, *nitric acid*,
sulphuretted hydrogen, *phosphuretted hydrogen*, water, and many
s, some of which, like certain of those just enumerated, are probably
y deleterious nature. These changes, decompositions, and recombi-
re greatly facilitated and hastened by increased temperature, and
re effected more rapidly in summer.

ORGANIC IMPURITIES.—The living organic impurities are in direct
, as already remarked, upon the dead, from which they derive their
nt and support, and like them, are either vegetable or animal.

egetable Impurities.—The living vegetable productions contained in
er are, algæ, which are the freshwater types of the plants commonly
ea-weeds, and water-plants.

nimal Impurities.—The principal animal productions contained in
fish, zoophytes, worms, larvæ of insects, mollusca, and animalculæ or

ces which favour the Growth and determine the Kinds of Organic Life present in Water.

has shown that *every vegetable* is composed of oxygen, hydrogen,
, with a variable but usually a small quantity of nitrogen.

rowth, therefore, of vegetables, it results as essential conditions that
be supplied with material containing the whole of these substances.
ne vegetable resembles in its general constitution another, it follows
ng vegetable matters contain the whole of the materials necessary to
plant, and thus one generation of plants affords the food requisite for
and sustenance of a second.

in inorganic substances also favour greatly the growth of plants, as
tes and ammonia; the latter probably on account of the nitrogen it
nd hence the value of animal manures, which contain these com-
ely, in promoting the growth of vegetation.

nalysis has shown that *every animal* contains precisely the same
the vegetable, with this important difference, however, that the pro-
nitrogen is much greater in the former.

ppears, that while vegetable substances in a state of decay are best
the maintenance of vegetation, animal matter, in a similar state, is
ted to sustain a large amount of animal life.

rticulars are capable of important practical application, inasmuch as
e to us that every water which abounds in living animal forms,
nfusoria, must also contain dead organic, and especially animal
bundance.

The true interpretation to be placed on the presence of infusoria in wate not well understood until we called particular attention to the conditi animalcular life in Thames water near to London, to which we shall her have occasion again to refer.

The relation of dead to living organic matter is well shown by simply diff a little albumen through a wine-glass of distilled water: in a few days especially if the weather be warm, the infusion will be found literally to s with animalculæ.

But there are some other circumstances, independent of the amount of organic matter contained in water, which determine the kind of living pro tions present in it.

One of these, and a very important one, is the condition of the water alkalinity or acidity. If the water have a decided acid reaction, and conta large amount of animal matter in solution, there will be an abundant deve ment of fungi in the course of a few days; but if, on the other hand, it exhi an alkaline reaction, then, instead of fungi, animalculæ principally wil developed.

These curious and important facts may be readily shown by experiment. two solutions of albumen in water be prepared, the one being rendered alkal the other acid; in the first, in the course of a short time, infusoria will app while in the second, in an equally short period, a scum of fungus will bec visible to the naked eye.

Now fungi are usually regarded by the naturalist as vegetable producti having, however, a resemblance to animals in the amount of nitrogen which contain, and in their subsistence on decomposing animal matter.

But other differences may be observed between acid and alkaline an solutions; while the animal matter contained in the alkaline fluids qui undergoes putrefactive changes, and begins to smell disagreeably, that in acid fluid scarcely alters at all, and emits no unpleasant odour.

From these facts it may be fairly concluded, that these two waters stan very different relations to each other in a sanitary point of view, and from important practical applications will in another part of this Report be deduc

But there are occasionally found in nature waters which, although lar impregnated with dead organic matter, yet contain neither animal nor veget productions in a living state; these are generally well waters contaminate sewage or the contents of cesspools. The reason of the absence of life in cases it is not difficult to divine; from the water in the deep and covered air, light, and warmth, are excluded, conditions essential to development.

The *kinds of vegetable and animal life* present in water vary much accor to their nature and chemical composition.

In the *still waters* of ponds, cisterns, and reservoirs, which contain vegetable matter, in the spring and summer, which is the great season of development of vegetation, we encounter living vegetable forms, espec confervæ.

In the same waters, holding in solution much animal matter, we meet living animal productions, particularly infusoria and entomostraceæ.

The forms of life inhabiting the *running waters* of springs and rivers usually very different from those which dwell in still waters; they belon different species and genera, and are provided with an organisation by w they are adapted to the very different life they are destined to lead.

The *quantity of animal and vegetable life* contained in water, also v according to its nature and composition.

Thus pure *distilled water* contains no organic matter, either dead or aliv

Rain water, caught at a distance from houses, towns, or other sourc contamination, contains none.

Uncontaminated well water contains no organic matter.

Neither does pure *spring water* contain any form or trace of organic matt

In *river water* there is present usually a considerable but variable amou organic matter; this amount varies according to certain well-determined cumstances; thus, at the source of the river, where the stream is comparat pure and unpolluted, the quantity of organic matter, either dead or livin but small.

As the stream flows along, however, it becomes exposed to numberless sources of contamination: it receives the contents of still smaller streams, and the impurities of innumerable ditches, the refuse of the dwellings of persons who live near its banks, the contents of drains, and very frequently the sewage of whole and populous towns, so that at last, when it reaches its outlet into the sea, great and manifold are the corruptions, and large is the amount of dead and living organic matter, pervading its waters.

Were it not that for the continually increasing impurities of river water there is a daily means of escape by the ocean, that description of water would be the most contaminated of all.

The *water of ponds* usually contains a large quantity of organic matter, because these also are exposed to many sources of contamination; the leaves of trees which grow near, fall each year into them, and successive crops of aquatic vegetation are developed and pass to decay in their waters.

The *water of reservoirs* likewise usually contains much organic matter; into these, water which is itself very impure is poured from time to time; on each occasion a portion of the contained organic matter subsides to the bottom, and thus at last a great accumulation of organic impurities occurs, sufficient in the course of a very short time to spoil and render unfit for use even the very best water.

Lastly, the *water of cisterns* generally contains much organic matter. A cistern may be compared to a reservoir; it is, in fact, a reservoir on a small scale, and in it, also, organic impurities increase from day to day, both by accumulation and growth.

It should be remembered that the actual quantity of organic matter present a large body of water, or even in a river, cannot be estimated from an examination of samples of water obtained by merely dipping a jar or bottle into it, ecause by far the greatest portion of organic matter is contained in the mud or ther deposit at the bottom of the reservoir or river. This fact has very generally een overlooked, and hence the proportion of organic matter given by chemists many cases as present in certain waters is by far too low.

The effect of the presence of organic matter in the sediment of a reservoir or ver on the entire body of the water contained in it is shown by placing a little such sediment in distilled water in a bottle; in a short time, especially if the ather be warm, the water will begin to smell offensively.

But there are certain circumstances which are closely connected with the nds as well as the *quantity* of organic life present in water, beyond those ready noticed; these are, free exposure to air, light, and warmth, which all eatly favour development, and so assist in determining the kind and amount tually present.

For the purpose of showing clearly the influence of these agents, we instituted considerable variety of experiments; as, however, the powerful operation of e causes referred to are well known and undisputed, it is unnecessary to detail eir nature.

Now rivers, reservoirs, and other large bodies of water are exposed to the inences alluded to, whereby the water contained in them is greatly deteriorated.

We have dwelt thus long, and fully, on the *Organic Impurities* of water, because their extreme and primary importance, for it is on these that the deleterious operties of impure water for the most part depend.

Until very recently, chemists did not in general attach sufficient importance these organic contaminations, and in most of their analyses we find the ferent kinds of organic matter, vegetable and animal, living and dead, all mped together, and included under the word "Traces."

Indeed, chemistry is but ill-adapted to investigate the nature of these organic atters; it gives but a very rough estimate only of their gross amount, and does t discriminate, as we have said, the animal from the vegetable, the dead from e living, and tells us nothing about the families, genera, and species, to which e numerous living productions contained in impure waters severally belong, of their habits and modes of life, &c.

This inquiry belongs to the naturalist, the physiologist, and the microscopist, d to ourselves belongs the credit of having first applied the resources of se, extensively, and in a practical as well as a scientific manner, to an examination of the actual condition of water in general, and particularly the of that now in use in the metropolis.*

Uses of Vegetables and Animals in Impure Water.—In the existence in pure water of different kinds of living organic productions, we recognis fulfilment of wise and beneficial purposes.

If all the organic matter present in some waters were to be removed b ordinary processes of putrefaction, decomposition, and the formation of sive and deleterious gases and compounds, incalculable mischief would const ensue.

To obviate this, nature has ordained that some of the organic matter of im water, in place of undergoing decomposition, should be imbibed by other living forms, and these dying, that other generations should take their and fulfil a similar important office.

In the deep well, where the conditions necessary to animal life do not the same end is accomplished, as we have already stated, by the formati nitrates out of the nitrogen of the organic matter.

The purposes fulfilled by living vegetable and animal productions in are then of an eminently useful and preservative character; and this observ is true particularly of the vegetable productions contained in it, incl both the lower forms, as the confervæ and other algæ, and the higher pl as the flowering; for these not only remove the organic matter dissolv water, by absorbing it into their own tissues for appropriation, but they further purify water by the effect of their respiration.

Animals, during respiration, exhale a large amount of carbonic acid, veget absorb this, fix the carbon in their own tissues, and restore the oxygen to th if the plant be aerial, and to the water, if it be submerged and aquatic.

INORGANIC IMPURITIES.

Water is a substance formed by the chemical combination of two gases, o and hydrogen, in certain proportions: these alone being necessary to its c tution, all other inorganic matters contained in it are to be regarded as unn sary, extraneous, and frequently injurious additions.

Under the head "Inorganic Impurities," therefore, we include, first, all inorganic substances which are merely suspended in the water, as sand and and, second, those substances which are in a state of actual solution, as the s earthy, and metallic salts, present in most waters, and the gases.

Inorganic Impurities in Suspension.—The inorganic impurities whic merely suspended in the water are the least important of all, since they d impart any deleterious properties; they consist chiefly of particles of a nature, which are therefore heavier than water, and are readily separated, by sudsidence or filtration.

The quantity of grit or sand in suspension in water varies with the con of the water, and the state of the weather.

If the water be kept in continual agitation, as by the passage of boats, b and steam-vessels, it will always contain a very large quantity of earthy m diffused through it, sufficient, indeed, to impart an opaque appearance a earthy colour: the water of the Thames near to London is usually in the described, and a sample of it is generally opaque and discoloured, by reas the immense quantity of earth and mud suspended in it.

Again, water kept in a state of motion by storms, wind, and rain, w affected in a similar way, and will be laden with earthy matter.

The water just poured into a dirty reservoir or cistern remains in the described for some hours after, in consequence of its stirring up the accum sediment contained in it.

Inorganic Impurities in Solution.—The salts contained in water may be d into the *earthy*, *alkaline*, and *metallic*, and it is to their presence that m the sensible properties of water are due, as its softness, hardness, alkalinit acidity.

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* Results of a Microscopical Examination of the Water supplied to the Metropolis, and the S Districts.—THE LANCET, March, 1850.

A Microscopical Examination of the Water supplied to the Inhabitants of London and the Suburb tricts, Illustrated with coloured plates. Samuel Highley, Fleet-street.

Evidence before the General Board of Health; Report, Appendix.

Evidence before Committee of the House of Commons on the Water Supply of the Metropolis.

is a property common to all the purer waters, as distilled, rain water,
possessed in greatest proportion by those waters which contain the
it of earthy salts.

lies or alkaline salts, however, possess the property of imparting
id hence their employment in soap and washing powders.

ree of *hardness* of water depends upon the amount of earthy salts
i it, that is, of sulphates and bicarbonates of lime and magnesia, but
of the bicarbonates.

linity of water is dependent upon the amount of alkalies present in
e principal of these being the carbonates of soda and potash.

ity arises of course either from the presence of acid salts, or some
s the carbonic.

come to consider "the different kinds of water," we shall have again
he sensible qualities we have thus briefly alluded to.

great metallic impurities or contaminations of water are those by
n, each of which, but especially the first, we shall consider in detail.

On the Action of Water on Lead.

anding that lead has now been employed for ages in the storage
ance of water, the principles of its action on that substance have
neral, but ill understood and defined: much uncertainty and con-
ave prevailed, even amongst scientific men, as to what waters act
d, and what least, some asserting that soft waters do so, and others,
aters affect lead most.

inciples will be found to be in strict accordance with the laws of
mbination.

ng of lead in connexion with water, we commonly make use of the
e action of water on lead;" this phrase, unless clearly explained, is
associated in the mind with error.

s we before observed, consists of oxygen and hydrogen; the only
, therefore, which could by possibility result from the decomposition
d the union of its elements with lead, consists in the formation of
d oxide of that metal—an almost insoluble compound.

aters in general use contain several gases and salts; these act on
riety of ways, or, in other and more definite words, form various
s with lead.

ater imbibes air and other gases; the oxygen of the former combines
d, and forms the oxide.

erefore, we speak of the action of water on lead, in general terms,
condition in which it is commonly met with is implied; but in our
quiries we must carefully discriminate between the effects of the
re water on lead, and those effects which result from the presence of
d gases so commonly contained in water.

t of the action of pure water, then, on lead, supposing it to be really
l, is to give rise to the formation of a hydrated oxide, the oxide like-
formed as the result of the presence in water of free oxygen, derived
mosphere.

me cases lead does not only exist in water as a slightly soluble oxide,
state of chemical solution, and we have now to inquire in what con-
ay be supposed to be in such cases. The most common soluble salt
ected in water is the carbonate, which consists of carbonic acid in
the oxide of lead.

xide is a body or base in combination with oxygen, which readily
any free acid with which it may come in contact: in a water, there-
rom the presence of free or uncombined carbonic acid, stored in a
el, and exposed to the air, all the chemical conditions necessary for
on of a soluble and dangerous salt of lead exist; the cistern is the
water itself, or the air contained in it, supplies the oxygen by which
f that metal is oxidized; and with the oxide thus formed the free acid
t readily combines.

now inquire how far these preliminary statements are supported by
ence, and shall detail a number of experiments which we have insti-

tuted for the purpose of ascertaining the effects of pure water, air, and the gases and salts contained in ordinary water, upon lead.

These experiments may be arranged under three heads: in the first experiments, pure water (that is, water free from gaseous or saline impregnation), oxygen, carbonic acid, and atmospheric air, separately and in combination, were employed; in the second, various salts and solutions of the caustic alkalies were operated upon; while, in the third set of experiments, the effects of certain waters now used for domestic purposes, on lead, were ascertained.

Experiments showing the Action of Distilled Water, Oxygen, Carbonic Acid, and Air, on Lead.

1st Experiment.

A piece of lead, having a clean and bright surface, was introduced into an eight-ounce bottle, filled with *distilled water* from which any oxygen or other gaseous admixture which it might possibly have imbibed had been expelled by previous boiling.

Results.—In the course of a very few minutes the metal lost its brightness, and when examined at the end of the fourth day the surface of the lead was found to be much dulled, was covered with a whitish crust, and adhered slightly to the glass by means of the same substance, which formed a coating on the metal, and which extended on to the glass for some distance around; the water itself also presented a slightly dull and opaque appearance, and contained a small quantity of sediment evidently derived from the metal itself; from time to time minute bubbles of gas were observed to collect on the sides of the vessel.

Tested with sulphuretted hydrogen the water became very *slightly darkened*, but when acidulated with a little acetic acid the test acted more strongly.

Remarks.—The white substance coating the metal, adhering to a portion of the glass, rendering the water very slightly opaque, and forming a small quantity of visible sediment, was the oxide of lead, a compound which is but little soluble in water. The rapid and almost immediate formation of this oxide cannot be satisfactorily explained, except on the supposition of the decomposition of a portion of the water itself, the oxygen going to the metal, and the hydrogen being liberated, and forming bubbles in the liquid. It is indeed possible that a trace of oxygen, notwithstanding the precautions taken to free the water of it, might have remained, but it appears scarcely probable that the whole of the very sudden, marked, and considerable effects noticed were attributable to this cause.

This experiment was repeated, and with the same results.

2nd Experiment.

A similar piece of lead was introduced into the same quantity of carefully prepared distilled water, into which *oxygen* gas had been passed.

Results.—In a very short time the lead lost its brightness, and at the end of the fourth day the following appearances were noticed: floating on the surface of the liquid a broken iridescent pellicle was observed; the water was somewhat opaque, and contained a powdery sediment; around wherever the metal had been allowed to rest for a time the glass had become coated; the surface of the metal was very much dulled and encrusted, presenting here and there greenish patches.

Tested with sulphuretted hydrogen, *a considerable discoloration* of the water took place.

Remarks.—The water in this case was more opaque than in the first experiment; it contained more sediment, and the metal was evidently affected to a greater extent; the oxygen had acted energetically upon the metal, had, in fact, combined with it, and formed the sparingly soluble hydrated oxide of lead.

A repetition of this experiment confirmed the results first obtained.

3rd Experiment.

In this experiment *carbonic acid* was substituted for oxygen.

Results.—For some time the lead did not appear to be perceptibly affected; the end of the fourth day, however, it had evidently become very slightly dull and rough-looking, the liquid remaining perfectly transparent, but having upon the surface a broken and iridescent pellicle.

ted.—The sulphuretted-hydrogen test *acted very decidedly*, much more n in Experiments 1 and 2.

narks.—The marked action of the test in this case, and the perfect trans- cy of the water, showed that it contained much lead in solution. Now, as xide is but sparingly soluble, the clear inference is, that the compound d in this instance was the deleterious carbonate of lead, the water probably own decomposition affording the oxygen required for the oxidation of the he oxide itself as quickly as formed being taken up and dissolved by the nic acid purposely introduced into the water.

s experiment was likewise repeated, and with the same results.

4th Experiment.

his experiment the water was made to contain both *oxygen* and *carbonic*

ults.—At the end of the fourth day the metal was slightly dulled only, and ter perfectly transparent and without sediment.

ted.—The sulphuretted-hydrogen test *acted most energetically*, and a precipitation of sulphuret of lead took place.

narks.—In this experiment all the conditions necessary for the formation rbonate of lead existed—viz., the presence of oxygen and carbonic acid, sult being that the salt in question was formed abundantly.

5th Experiment.

illed water saturated with *carbonic acid*, and containing a piece of lead, *posed to the air* for four days.

ults.—At the end of that time the metal was slightly dulled, and presented ish appearance; the vessel also was coated with oxide at the spot where d rested.

ted.—The water was *very slightly acted upon only* by sulphuretted hydro- ven after acidulation; but the part of the vessel coated with the oxide, and hich the metal had rested, became quite black.

arks.—In this case a considerable amount of oxide was found, but only l quantity of the carbonate of lead; the metal was oxidized chiefly through ygen of the air absorbed, while the principal part of the carbonic acid at resent in the water escaped during its exposure to the air.

riments showing the Action of various Salts contained in Water on Lead.

6th Experiment.

cruple of crystallised *sulphate of potash* was dissolved in six ounces of ed water; solution neutral.

ults.—Metal dull and greenish, adherent slightly to bottle; water not tly transparent, and containing a little sediment.

ted.—After the lapse of a month, with sulphuretted hydrogen, *no percep- ffect* was produced.

marks.—In this experiment a little oxide of lead was evidently formed, but early equal in amount to that noticed in the experiment No. 1, with distilled r only; nor was any of it taken up by the water, otherwise the test would afforded indications of the presence of the lead.

7th Experiment.

scruple of dried *carbonate of soda* was dissolved in the same quantity of r; solution alkaline.

sults.—Metal slightly dulled, but no opacity of the water and no sediment rved.

sted.—At the expiration of a similar length of time, *no perceptible effect* ed with sulphuretted hydrogen.

marks.—In this experiment, still less oxide—in fact, scarcely any—was ed.

8th Experiment.

scruple of crystallised *carbonate of potash* was dissolved as before; solution ine.

Results. — Metal dulled, and in places covered with patches of a bro colour; no sediment; water transparent.

Tested. — A *decided reaction* ensued with the sulphuretted-hydrogen although the lead had only been immersed in the solution three days.

Remarks. — The results of this experiment show that all alkaline carbo even do not act in the same manner on lead. As the solution did not co free carbonic acid to combine with the metal, it is probable that a plumbi potassa was formed.

9*th Experiment.*

In this experiment a *slightly alkaline* solution of *bicarbonate of magnesi* employed.

Results. — At the expiration of twenty-four hours the metal was very sli dulled only on the upper surface, and the water was transparent, and wi sediment.

Tested. — A few hours after the immersion of the lead in the solution phuretted hydrogen was passed through it, and produced *a very decide coloration.*

Remarks. — As in this instance, also, no free carbonic acid was presen action of the solution on the lead is probably to be referred to the magne

10*th Experiment.*

This experiment was made with a scruple of *phosphate of soda;* so nearly neutral.

Results. — Metal quite bright; no opacity, and no sediment.

Tested with sulphuretted hydrogen; *no reaction.*

Remarks. — This experiment, as well as experiments No. 6 and 7, seem c to show, that certain salts exert a protective influence over the lead, and a prevent its oxidation.

11*th Experiment.*

In this experiment a scruple of *chloride of sodium* was used; solution n

Remarks. — The lead was dull, and rather green; the water slightly o with a very little precipitate.

Tested with sulphuretted hydrogen the solution became *decidedly disco* and darkened.

Remarks. — The quantity of oxide present was very small, too much account satisfactorily for the decided action of the test; it is therefore e that in this instance a soluble chloride of lead was formed.

12*th Experiment.*

In this experiment *chloride of calcium* was substituted for the chlor sodium; solution slightly acid.

Results. — Metal nearly as bright as when first immersed; water transp

Tested. — *No perceptible reaction* with sulphuretted hydrogen.

Remarks. — The non-effect, or, at all events, the scarcely perceptible ef the solution on lead in this experiment is probably to be explained by the affinity of the chlorine for the calcium, and which exceeded that of the itself for that base. We thus perceive that chlorides, like the carbonat not all act on lead in the same manner, and that it is necessary that eac met with in water should be made the subject of experiment, and its effe lead thus ascertained.

13*th Experiment.*

A solution of *chlorine* and distilled water was prepared; reaction slightl

Results. — At the end of twenty-four hours the metal presented marke dences of the action of the chlorine; it was rough and eroded, with he there bright crystalline spots.

Tested. — The *reaction* of sulphuretted-hydrogen test was *exceedingl marked.*

Remarks. — In this experiment it is scarcely necessary to say that the cl ed directly with the metal, and formed the soluble chloride of lead.

14*th Experiment.*

his experiment a solution of *nitrate of baryta* was prepared, which was at
eutral to test-paper, but became subsequently slightly alkaline.
ults.—Metal very greatly affected, covered with a thick whitish crust, and
ish-green patches; water somewhat opaque, containing much sediment,
also coated the sides of the bottle extensively, and was of a yellowish-green
wherever the metal had been allowed to rest for a time.
ted, with sulphuretted hydrogen, *a slight reaction* ensued, much increased
cidulation.
arks.—Although in this case a large quantity of oxide of lead was formed,
t little became dissolved: the formation of the oxide is explained by the de-
sition of the nitric acid of the nitrate, its oxygen combining with the metal.

15*th Experiment.*

cruple of *liquor potassæ* was dissolved in water.
ults.—Upper surface of metal thickly coated with a yellowish crust, lower
less affected; fluid transparent, without sediment.
ted, with sulphuretted hydrogen, the fluid became perfectly *black,* and after
deposited a copious sediment.
arks.—The water in this case contained an enormous quantity of lead,
ly in the form of plumbite of potassa.

16*th Experiment.*

iece of lead was introduced for a few minutes only into *lime-water,* which,
ng tested, gave *abundant evidence of the presence of lead.*
arks.—The salt formed in this instance was also, probably, a plumbite.
s appears that the alkalies act with extraordinary energy.

17*th Experiment.*

cruple of *chloride of calcium* and half a drachm of *sulphate of potash* were
ved in distilled water; solution neutral.
ults.—At the end of three days the metal appeared slightly dulled only,
lution retaining its transparency.
ted.—*A decided reaction* with sulphuretted hydrogen.
arks.—By previous experiments we ascertained that while chloride of
m acts very decidedly on lead, sulphate of potash not only did not form any
rious compound with it, but it was even evident that it exerted a protective
nce, preventing the excessive oxidation of the metal. The above experi-
, therefore, was devised to ascertain to what extent this protective influence
t be relied upon, and from its results it appears that the chloride was not
pletely prevented from producing its ordinary effects, although, perhaps,
were scarcely so strongly marked as in the experiments in which chloride
dium alone was employed.

addition to the above experiments, some others were made, but of these it
necessary to give any lengthened description. Thus, precipitated carbonate
lime was diffused through distilled water in contact with lead; the fluid
ibited a slightly alkaline reaction, and, tested at the end of four days, indi-
ions of the presence of lead were afforded. Again, a sufficient quantity of
bonic acid to render the solution feebly acid, was passed into distilled water,
taining the same carbonate of lime. In this case distinct traces of lead were
tected. Lastly, crystallised carbonate of magnesia, obtained by the evaporation
Sir James Murray's "fluid magnesia," after being well washed, was diffused
ough distilled water; the solution became strongly alkaline, and was found at
end of four days to contain much lead.

xperiments showing the Action on Lead of certain of the Waters now in use.

The results of these experiments will be given in another part of this Report;
ir omission for the present will not, however, interfere with the conclusions
be deduced from the preceding experiments, and which have been devised for
purpose of illustrating the "principles" which determine the action of water
lead.

Conclusions to be deduced from the preceding Experiments.

Reviewing, then, the results of the experiments just detailed, we arrive at t following conclusions :—

1st. That lead in contact with water is oxidised in at least two, if not thre ways, through the oxygen of the atmosphere imbibed by water, through t decomposition of certain substances present in water which contain a lar quantity of oxygen, as the nitrates, and probably in some instances by t decomposition of water itself.

2nd. That the oxide formed in these cases is the hydrated oxide, a compou sparingly soluble only in water, but which readily enters into combinati with any free acid present; the ordinary acid contained in water being t carbonic, with which the oxide will form either a soluble or insoluble sa according to the amount of acid existing in the water.

3rd. That as pure distilled water, freed as far as practicable from oxygen, a enclosed in a sealed vessel, acts quickly and energetically on lead, t action depending most probably upon the decomposition of the water; rai snow, or other water, free from gaseous or saline impregnation, and th closely resembling distilled water, acts in a similar manner. It is to be r membered, however, that the compound formed is the hydrated oxide lead, which is but little soluble.

4th. That in distilled water, also included in a sealed vessel, from which t oxygen has been expelled by boiling, carbonic acid being subsequently pass into it, a soluble carbonate of lead is readily formed, the salt in questi being generated still more quickly and abundantly when oxygen as well a carbonic acid is freely added to the water.

5th. That while dried carbonate of soda does not act injuriously on lead, cry tallised carbonate of potash, the carbonates of magnesia and lime, and th alkaline or neutral bicarbonates of the same, exert a marked solvent actio

6th. That solutions of the caustic alkalies, soda and lime, act in a most ener getic and destructive manner on lead.

7th. That while chloride of calcium exerts little or no effect, chlorine an chloride of sodium act very decidedly.

8th. That certain salts, as sulphate of potash, phosphate of soda, and some oth salts, principally sulphates and phosphates, appear to exert a protecti influence on lead, as is shown by the slight oxidation of the metal whic takes place when these salts are dissolved in distilled water.

From the foregoing results we deduce the further conclusion —

That distilled or any other water approaching this in character, cannot wi perfect safety be stored in open reservoirs or cisterns, on account of t oxidation which takes place; this oxide, as already stated, is, however, b sparingly soluble, and is rendered still more so by conversion, when e posed to the air, into a peculiar and very insoluble carbonate.

That water containing free carbonic or any other acid, and which therefo exhibits an acid reaction, cannot be stored in lead, or conveyed to conside able distances in that metal, without the greatest danger to health.

Neither can water containing carbonate of potash, the carbonates of magne and lime, or alkaline or neutral earthy bicarbonates, in considerable amoun be thus stored or conveyed with safety.

The same remark applies to waters containing either free chlorine or mu chloride of sodium.

Also to those which contain nitrates in any considerable quantity.

It likewise particularly applies to waters containing caustic lime or potash.

It is possible that the deleterious effects of some, but certainly not the pr cipal, of the salts referred to, may be counteracted by the presence of protect salts: we have seen, however, by experiment, that half a drachm of sulph potash did not protect the lead from the action of a scruple of chloride of s

We thus perceive how formidable are the objections which exist to the in criminate storage and conveyance of water in lead. We will now, howe refer to certain circumstances, which show that the danger of the use of le although on the whole very great, is not quite so much so as might be suppos on a perusal of the above statements.

the number of *acid waters* in use is but very small, still some exist, and
loyed for domestic purposes.

, of all known waters, probably Thames water contains the greatest
ion of chloride of sodium, nearly the whole of this salt, consumed by the
nts of London, being poured into it from the sewers; in most other
he amount is not nearly so great.

y, the nitrates are present in large quantity in very few waters stored in
; although they are contained in appreciable amount in Thames water.
nost frequent causes, therefore, of the action of water on lead are the
bicarbonates, and next the carbonate of potash and free carbonic acid.

he whole of the preceding observations and experiments relate to the
f *chemical action* on lead; we have now to consider those produced by
c action.

s been frequently observed, that leaden cisterns and pipes are not un-
ly corroded away, and even eaten into holes, the parts of the cisterns
bject to this erosion being the bottom and the soldered joints.

ell are plumbers acquainted with this important fact, that the bottoms of
are always made much thicker than the sides.

this erosion or eating away of the substance of the lead into holes is
d by many as attributable to galvanic action; it is difficult, however,
instituting many experiments, to say how much of these effects is due
ical, and how much to galvanic, causes.

e the corrosion takes place at the soldered joints, or where the cistern or
elf is made up of two metals unequally blended, as lead and pewter, which
ently the case, it may fairly be attributed to galvanic action.

e same cause the corrosions which occur immediately around pieces of
or lime, cinders, and fragments of dead organic matter, have been re-
by eminent chemists. From Experiments 16 and 17, which show the
l action of even dilute solutions of the caustic alkalies on lead; it is
that the cause in these instances is purely chemical.

rs and organic fragments likewise contain earthy alkalies and salts, and
t are well fitted by their chemical composition to act powerfully on lead.
act that it is the bottom of the cistern which chiefly suffers is explained
y the circumstance, that on this constantly rest all the solid impurities,
nd organic, so largely contained in the great majority of waters now in
nother probable cause is the partial precipitation of the earthy salts,
requently takes place in the cistern on the exposure of water to air.

are still some other facts connected with the action of lead on water, to
e have not as yet particularly adverted.

has been written on the subject of the *protective crust* formed on lead;
e but little faith in any such protection. When the white film or coat-
ms but slowly in water, in most cases we may probably safely conclude
s water does not act quickly and energetically on lead, but its absence
invariably excite the suspicion that the water contains some salt or acid,
kes up the oxide as soon as formed, in which case the metal preserves
and bright surface.

her subject for consideration is the different effects on lead of the constant
ermittent supply of water. There can be little question but that the evil
are less with the constant than with the intermittent system, since the
llows of the periodical admission of the atmosphere to all parts of the
istern and pipes, whereby an increased formation of oxide ensues.

y, it has been noticed that the lead of the cistern is particularly liable to
ted at the line of the watermark. Two causes conspire to produce this
one is, the constant action of air and moisture; and the second, the
which arises by evaporation from the surface, and which resembles in
position, and therefore in its action, distilled water.

a review, therefore, of the whole of the arguments and experiments
vanced, respecting the action of different waters on lead, we deduce the
ng general conclusions:—

while very soft water cannot be stored for a lengthened period, with
ty, in leaden vessels, the danger of the storage of hard water, under the
rcumstances, is in most cases much greater. This danger, however, is to

be estimated neither by the qualities of hardness or softness, but altogether depends upon the chemical constitution of each different kind of water: thus, if this be ever so soft, and contain free carbonic acid, its action on lead will be great; whereas, if it be hard, from the presence of sulphates and phosphates, principally, and contain but few bicarbonates, &c., little or no solution of the lead will result.

We will now proceed to examine the evidence given on the subject of the action of water on lead by different authorities; and first we advert to that of Dr. Christison, the eminent toxicologist.

Evidence of Dr. Christison.—So far back as the year 1829, Dr. Christison made known some valuable observations on the action of water on lead. To these, however, it is unnecessary to refer, since that gentleman has recently been called upon by the General Board of Health to state the opinions now entertained by him on that subject,

From an examination of this statement, we find that Dr. Christison, recognises two causes of the corrosion of lead—the one *chemical*, the other *galvanic*.

The first action of water, he states, results in the formation of the hydrated oxide, which is dissolved by the water, but which, under exposure, is for the most part separated quickly in the form of a peculiar variety of carbonate of lead, which is insoluble.

"Another essential condition," Dr. Christison writes, "is purity. The purest water acts most intensely; distilled water most of all; rain and snow water next; very pure spring-water next, but much more feebly; and of all spring waters, those called *hard*—that is, which largely contain sulphate and carbonate of lime—act least, producing, indeed, no effect at all when these salts abound."

Now, while it is admitted that the partially soluble oxide of lead is quickly and abundantly formed in distilled and other very soft waters, to be soon converted, as Dr. Christison states, into a peculiar and insoluble carbonate; while also, it is conceded that certain of the salts ordinarily contained in water retard the oxidation, and thus exert a protective influence, we demur to the general conclusion, that hard waters, especially those containing carbonates, act least. This conclusion is inconsistent with several of the experiments previously detailed, and also with actual observation; it is, in fact, wholly untenable.

Again: Dr. Christison writes—"The action" (that is, the formation of the oxide) "is counteracted by the presence of salts in the water. All salts more or less impede the action. But their energy in this respect is very different."

"Those act most energetically whose acid forms with oxide of lead the most insoluble oxide of lead. Hence phosphates and carbonates are most powerfully protective; chlorides, acetates, and nitrates, least; sulphates intermediate. As carbonates and sulphates are contained in most terrestrial waters, few of them exert the corrosive action now complained of."

We have shown clearly and beyond question, that chlorine, certain chlorides, the nitrates, and nearly all the carbonates, especially the earthy carbonates, exert marked injurious effects on lead. It is therefore obviously improper to include these salts amongst such as appear really to possess limited protective powers.

Again: "The bases of the salts have nothing to do with the action, further than that some base is necessary to form a salt. It does not in the least, therefore, signify what the base is."

This assertion, likewise, is manifestly incorrect, as proved by experiments No. 16 & 17, in which it is shown that dilute solutions of the caustic alkalies act in a most extraordinary manner on lead.

"The protective power of these salts may possibly be counteracted by certain ingredients in the water. This has been hitherto supposed, at least. For example, it is thought that an excess of carbonic acid may counteract the pro influence of the salts. There is no sufficient evidence, however, to that nor am I acquainted with any other counteracting ingredient. My present opinion is, that when corrosion occurs, in spite of the presence of protective salts, the real agent is the second cause of corrosion, to be noticed immediately."

In answer to the above observations, we reply, that there can be no question

t an excess of carbonic acid does counteract any protective influence
e salts present may exercise. The action of free carbonic acid is shown
iment No. 4; and hereafter we shall have to speak of the effect produced
by a water, acid from the presence of carbonic acid.

second cause of corrosion on lead—viz., galvanic action, Dr. Christi-
butes all the partial actions often seen on the inside of lead pipes or the
f lead cisterns, particularly when lumps of mortar &c. have been left in
rns.

nsider that several of the effects enumerated by Dr. Christison are
e to chemical than galvanic causes, and we have already adduced our
or regarding the action of mortar on lead as chemical.

st the circumstances which favour this partial corrosion, Dr. Chris-
its that a superabundance of salts is very probably one; for salts, he
increase the exciting power of water in an ordinary galvanic apparatus.

dmission, coupled with the fact that leaden cisterns are scarcely ever
by a general and uniform action over their whole surface, but nearly
partial and irregular corrosion, from whatever causes produced, che-
galvanic, is in itself alone sufficient to establish a clear case against the
inate storage of hard water in leaden vessels.

regarded as the second cause of action on lead by Dr. Christison is
therefore, very much the more destructive of the two, and is that which
as been least considered.

ve now to cite the general conclusions at which Dr. Christison is
arrive—1st. "That lead may be safely and conveniently used for ser-
and cisterns in the case of almost any water that can be obtained in
ry." 2nd. "On the whole, my present opinion is, that the fewer diffi-
l be encountered in using lead pipes and cisterns in the case of waters
rable purity. Theory would lead to this conclusion; for while the
of such water to exert a simple solvent action may be easily counter-
ertain precautions, there will be less risk of troublesome corrosion by
nfluence. And actual experience confirms theory, at least in regard to
waters of the ordinary constitution. For long usage has established
safety and convenience of lead for service pipes and cisterns in Edin-
ere the water is certainly very pure. And I may mention that I am
inted with the circumstances of a confirmatory incident in regard to a
much greater, indeed, of very rare purity."

d scarcely state that we entirely dissent from the first conclusion.

ll now briefly consider the evidence given before the General Board of
Mr. Thomas Spencer and the Hon. W. Napier.*

e of Mr. Thomas Spencer.—After some preliminary remarks, Mr.
rites:—"We thus arrive at two conclusions—one, that air and water
m an oxide which *is insoluble in soft water;* the other, that hard water
o form this oxide, but that *in the latter it becomes soluble.* We are
fully justified in stating, that hard water in connexion with lead is
gerous than that which is soft."

e shown, particularly by Experiment 1, that the oxide formed in dis-
r *is partially soluble.* The nature of the chemical operations whereby
is dissolved by hard water, are not explained by Mr. Spencer; he
tes that it is dissolved.

making a series of experiments," the nature and details of which are
bed, Mr. Spencer remarks:—

that water which derives its hardness chiefly from supercarbonate
sia is more dangerous than water which altogether or in greater part
hardness from supercarbonate of lime. I find, then, that the follow-
f hard water are capable of dissolving the hydrated oxide of lead.
placed in the order of their solvent power, and consist of supercar-
magnesia, supercarbonate of lime, chloride of sodium, chloride of
n, chloride of calcium.

may be necessary to verify these results by some readily made ex-
requiring little chemical experience, I subjoin the following:—

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* Report on the Supply of Water to the Metropolis. Appendix III.

"Make a hydrated oxide of lead, by dropping its acetate (sugar of lead) into a solution of ammonia. The resulting powder is the oxide, and represents that which is formed by atmospheric action in water. Let it be washed until the water shows no indications of lead by sulphuretted hydrogen. A few grains of the oxide thus formed are to be put, while moist, into a bottle containing a few ounces of what is termed fluid magnesia (sold in the shops as Sir James Murray's fluid magnesia). It may be diluted with half or four or five times its bulk of water, its solvent power being in the ratio of its strength. After agitation for a few minutes let it be filtered, and when the usual tests are applied to the filtrate of magnesian water, it will be evident that the oxide of lead has been dissolved.

"This fluid magnesia is chemically identical with the supercarbonate of magnesia found in hard water; the simple carbonate being in both cases held in solution by carbonic acid. This experiment shows the solvent power of magnesia when found in hard water.

"Another experiment may be made to prove that the supercarbonate of lime also dissolves this oxide. To do so it is only necessary to repeat the foregoing, but substituting carbonate of lime-water for the magnesian. That sold in the shops as "Carrara Water" (being carbonate of lime held in solution by carbonic acid) precisely represents the carbonate of lime which is found in hard water.

"Upon applying the test as before, it will be found that this also dissolves the oxide, but less so than in the preceding instance.

"The free carbonic acid, which is to be found in these artificial waters, does not contribute to these results, for should it combine with the oxide the resulting carbonate is insoluble."

These experiments are open to grave objections; the fluid solutions of magnesia and lime referred to, contain much free and uncombined carbonic acid, so much indeed as to cause them to exhibit an acid reaction. Now, as we have elsewhere shown, free carbonic acid acts very strongly on lead, forming, when in excess, a soluble salt; the effects observed in these cases, therefore, are partly due to that acid; and it is impossible to state how much of them was owing to the acid, and how much to the bicarbonates of lime and magnesia. These salts as contained in water are not acid, but either alkaline or neutral, and in order to obtain correct results it is necessary to experiment with such acid solutions.

We must not omit to state, however, that the conclusion at which Mr. Spencer arrives is, that "hard water, in connexion with lead, is more dangerous than that which is soft."

With this conclusion we fully concur.

Evidence of the Hon. W. Napier.—It now only remains that we examine the evidence of the Hon. W. Napier. This evidence is of a very useful character, and is directed to the purpose of ascertaining, by observation, the positive effects produced by different waters on lead pipes, pumps, and cisterns.

Mr. Napier examined no less than sixty-four cisterns and pumps: the properties of the waters, their degrees of hardness, and their action on lead, are exhibited in a tabular form; the period during which the cistern or pump has been in use being likewise noted down.

On looking over the table, we observe that one water, having twenty degrees of hardness, but no carbonic acid, had not produced any visible effect on the pump-cistern, even after upwards of forty years' use; and that other waters containing much carbonic and sulphuric acid, but of only one degree of hardness, had acted considerably on the pump-cisterns. These are forcible illustrations of the principle which we have already laid down, that we are to look rather to the chemical qualities of the water than to the degree of its hardness, although, at the same time, the very fact of a water being hard affords presumptive proof that it contains those salts of magnesia and lime, &c., which, by experiment, have been ascertained to act strongly on lead.

From the data afforded by the table, it will be seen,—

"1. That 13 house-cisterns were examined, which had contained, for periods varying from 1¼ to 12 years, the pure soft spring water of Farnham Hill, of egree in hardness, and that in no case was any action whatsoever visible on ie lead.

That one pump, erected in 1808 over the soft-water tank at the market- ace, showed slight traces of erosion after 42 years.

hat 50 cisterns of leaden pumps over shallow wells of old and modern te were examined.

hat 10 of these showed scarcely perceptible, or total absence of erosion.

hat the remaining 40 bore evidence of varied action, from trifling to very tensive erosion and eating up the lead.

hat in the case of the 13 house-cisterns containing soft spring-water, no ice of carbonic acid is detected.

hat in the case of the 10 pump-cisterns which exhibited no erosion, no rbonic acid gas, or mere traces, were detected in the water

hat in the other 40 which bore marks, in most cases, of a violent action— existence of carbonic acid was ascertained almost in proportion to the tent of the ravages on the lead.

hat the hardness or softness of the well-waters does not seem to bear any portion as to their erosive action."

wing these results, the evidence of several experienced plumbers is which confirms, in the strongest manner, the now unquestionable fact, is based both upon scientific experiments and principles, as well as positive tion, that as a rule, hard waters act much more on lead than soft; this con- being the very reverse of that commonly but erroneously entertained. estimony brought forward by Mr. Napier is of such a striking character, l we space we should have been glad to quote some portions of it. ave dwelt thus long upon the subject of the action of water and its con- alts, on lead, because, first, of the contradictions and uncertainties in- in the scientific evidence hitherto given; and, second, because of the importance of the subject in a sanitary point of view. We believe, how- at after an attentive examination of all the facts contained in this Report, *be but one opinion respecting the impropriety of the general use of leaden for the storage of water, and the corrosive action of hard water in par-*

On the Action of Water on Iron.

l not be necessary to consider the subject of the contamination of water as fully as we have discussed the action of water on lead; because, first, e chemical facts and principles referred to under the head of lead, for t part are equally applicable to iron, and because, also, the salts formed at metal are not of the same poisonous character as those of lead, nor do st in any great quantity in the waters furnished to the inhabitants of tropolis.

ost of the waters supplied by the public companies, however, traces of generally to be detected: this metal is not in general present in the t its source, but is derived from the iron pipes in which it is conveyed tributed.

how that the action of water on iron is regulated by nearly the same les as those which determine its operation on lead, we will give the of four experiments only.

riments showing the Action of Distilled Water, Oxygen, and Carbonic Acid, on Iron.

1st *Experiment.*

ece of polished iron was introduced into a six-ounce bottle filled with *l water*, and from which all gaseous admixture had been as far as possible d by previous boiling.

lts.—For the first two or three days the metal preserved its brightness, the end of a week its upper surface was covered with a powdery substance, d colour, and the lower encrusted with several dark green patches; a uantity of the red sediment was also present in the liquid.

Tested.—A solution of ferrocyanide of potassium acted decidedly without acidulation, thus showing that a portion of the iron was held in solution. Tincture of galls scarcely produced any effect.

Remarks.—The red substance found in this case was the sesquioxide of iron, and the patches of a green colour were probably constituted of the hydrated black oxide.

2nd Experiment.

In this experiment *oxygen gas* was passed into distilled water in contact with iron.

Results.—The metal became affected more quickly than in the first experiment, and to a much greater extent; its upper surface was covered with red oxide, and the under with black patches; the water, also, contained a copious sediment of the same red oxide.

Tested.—The test acted less decidedly than in the previous case, but much more strongly after the solution had been rendered acid.

Remarks.—The oxidation of the metal was evidently much increased by the presence of the oxygen.

3rd Experiment.

In this experiment *carbonic acid* was substituted for oxygen.

Results.—At the end of a week the metal was very slightly rusted only, with patches of black oxide on its under surface; the liquid was but slightly tinged, and contained no sediment.

Tested.—The reaction with ferrocyanide of potassium was very strongly marked, and the ferridcyanide of the same base showed slight traces of the presence of a proto-salt of iron.

Remarks.—The carbonic acid present had united with all the oxide of iron formed, and so held it in solution.

4th Experiment.

In this experiment both *carbonic acid* and *oxygen* were employed.

Results.—After a few days the metal became covered with rust, the liquid assumed an ochreous colour, and was found to contain some granular sedime

Tested.—On the addition of a solution of ferrocyanide of potassium, the water became of a deep prussian blue, and the ferridcyanide also gave evider of the presence of a proto-salt.

Remarks.—In this experiment, all the conditions necessary for the formati of a soluble carbonate of iron existed, and, as shown by the action of the te that salt was abundantly formed.

On the Gasses Present in Water.

Water possesses the remarkable power of absorbing, in certain definite pro portions, the majority of those gases with which it happens to come in contac thus it even imbibes a certain amount of the gases of which the atmospher itself is constituted, as well as of any other gaseous impregnations or impuritie which it may contain.

This power of absorption is not equal for all gases, water being capable taking up a much larger quantity of some gases than of others, but of all th ordinary kinds it absorbs several times its own volume.

The amount of any particular gas present in water also depends very muc upon its temperature: in general, the colder the water the greater its power absorption, and the greater will be the quantity of that gas contained in it while, on the other hand, the warmer it is the less gas will it retain, a portion that previously imbibed escaping from it. The knowledge of this fact explain why a water which when cold tastes brisk and pleasant, when slightly warme only, as by exposure to the sun, becomes insipid and flat, the gases consistin chiefly of oxygen and carbonic acid, which impart to cold water its freshnes having in great part been expelled.

So great is the power of temperature in determining the amount of gas co tained in water, that nearly the whole of it may be driven off by the simple a of boiling. This circumstance, whilst it in some cases affords us the means getting rid of certain of those noxious gasses not unfrequently imbibed by wate *explains also* why recently boiled water is so flat and tasteless.

antities of any particular gas absorbed by water are, at equal
and under the same pressure, equal; when therefore, a water,
mstance, contains a less proportion of any gas at a certain tem-
s proper to it, its power of absorption is greatly increased, so
y exposed, it quickly imbibes the quantity of which it is deficient,
ess other disturbing causes are in operation, it ceases to absorb

low, then, from the preceding, that the power of absorption of
of its gases by boiling, and afterwards allowed to become cold, is
d this is really the case.
tant law just noticed, we recognise a beautiful manifestation of
he oxygen of water is constantly varying in amount, even at the
ure, and under the same pressure, it being continually used up in
f the various substances present, and in the respiration of the
ions contained in water; and were it not for the law, that in exact
this reduction in the amount of oxygen is the power of absoption
gmented, these living productions would be in constant danger

e existence of this law is obtained by observing what happens
frozen over: the uncongealed water beneath the crust of ice is
y further supply of oxygen from the atmosphere, but the sources
ich we have referred by the respiration of fish and other animals,
hence the oxygen being exhausted, unless the crust of ice be
r admitted, all living things, especially fish, speedily die.
crust of ice and the surface of the water a stratum of air is inter-
n this, so long as it lasts, the water continues to derive its supply

ience to the law that water, at a certain temperature, and under a
, takes up a definite quantity of oxygen, that the loss of oxygen
during the heat of the day is made up at night by the increased
h takes place as soon as the temperature has become reduced.
s briefly referred to the chief circumstances which affect the
er, we will next treat of the gases contained in it, in an equally
These may be divided into such as are natural to water, and with
ost constantly associated, and into those which are only occa-
t, and which perform no useful purpose connected with it.
which may be said to be natural to water are, *oxygen* and *carbonic*

gen of water is entirely derived from the atmosphere by imbibi-
tity of this gas present in any water is, as already stated, to a
pendent upon temperature.
water, that is, water containing its proper proportion of oxygen,
, of necessity, be cold; if it has been recently boiled, or has been
any way, as by exposure to the sun or the warmth of a close room,
xygen will have been expelled, and it will taste flat and insipid
aëration.
he amount of oxygen present in water, the more wholesome will
rage, for this gas is necessary to the active performance of several
portant vital functions.
acid of water is derived from two sources—the atmosphere and
d earthy carbonates contained in most hard waters.
here contains one part in a thousand only of this gas, and hence
of it present in water, is in combination with the alkaline and
water.
erefore, soft water contains much less carbonic acid than hard.
nt in large quantity, this gas contributes to the briskness of
ot, however, a necessary adjunct to good water; indeed, we are
ink an excess of carbonic acid would be rather injurious than
ater used as a beverage.
which are only occasionally present in water, and which are not
are *carburetted*, *phosphuretted*, and *sulphuretted hydrogen*; to
may be added.

Carburetted hydrogen, the "fire-damp" of coal mines, and the "marsh gas," is formed in large quantity by burning coal, and is also generated in small amount during the decay and decomposition of vegetable tissues.

It is an inflammable, irrespirable, and therefore noxious gas.

Phosphuretted hydrogen is formed during the decomposition of animal matter. It is a spontaneously inflammable gas, and forms the "Jack-o'-Lanterns" an "Will-o'-the-Wisps," sometimes observed in damp and marshy spots, and whic have often been the cause of much needless terror.

Sulphuretted hydrogen is generated during the decomposition of both vegetabl and animal matter, but principally the latter.

This gas is possessed of a highly offensive smell, and gives rise to injuri and not unfrequently fatal effects when introduced into the animal frame.

It is always present in large quantity in sewer water, and when disengag has been the cause of many fatal accidents, which have from time to tim occurred in the sewers themselves. It may very generally be detected, pointed out by ourselves, in the water of the Thames near to London, and might have been anticipated when the fact is called to mind, that the sew water of the whole of London, which contains such immense quantities of th gas, is daily poured into the river.

We shall hereafter adduce experiments, showing the action of the sulphurett hydrogen of sewer water upon animal life.

The *ammonia* sometimes present, in water containing a large amount organic matter, is also derived from decomposition. It is not usually to b detected in a free state, but exists in the form of carbonate of ammonia, in wh condition it may also be frequently discovered in Thames water, as will be sh hereafter.

In addition to the above described impurities, organic, inorganic, metallic, gaseous, impure water frequently contains a variety of other substances, nature of the greater part of which has not hitherto been determined, and which many of the injurious properties of bad water are to be referred.

Thus, the water of the Thames near London contains *urea*, *bile*, and a *of other effete and deleterious animal substances*, which reach it through sewers.

The deleterious and abominable qualities of Thames water near London frequently be shown by simply boiling it, when it will emit an odour in highest degree offensive and disgusting.

On the Purification of Bad Water.

Having now considered the different impurities of water, we will next tre the means by which these may, to a greater or less extent, be removed.

Several means are known by which the bad qualities of very impure may be to some extent improved.

On Filtration.—One of the most common as well as effectual means of fr ing water from a portion of its impurities, is filtration.

Now filtration is of two kinds, *mechanical* and *chemical*. The principal thods of filtration in use, however, are chiefly mechanical in their action, effect only the solid impurities of water, or those which are in susp merely.

The chief media of chemical filtration are soils: animal charcoal is p mechanical, although it exerts some chemical action as well on the water wh passes through it.

The mechanical powers of "patent filters" are by no means perfect, they separate only the larger particles, earthy and organic, and allow of passage of the smaller, including even many of the lesser animalculæ.

Since, then, filters do not completely separate the whole of the solid impuriti water, those which are fluid and in solution of course readily pass through

It is therefore evident that *the best filter is no substitute for bad water.*

Much useful and interesting matter on the subject of filtration mig been introduced had we space; we, however, refer the reader to our work "Supply of Water to the Metropolis," already mentioned, as well as to dence of Professor Way, given before the General Board of Health.

ddition of Lime to Water.—The hardness of water, as has already
s, to a great extent, dependent upon the earthy salts contained

carbonates of lime and magnesia are insoluble, the bicarbonates
water; it therefore occurred to Professor Clark, that by adding an
antity of caustic lime, in the form of lime-water, to water rendered
ly bicarbonates, the excess of acid of these would unite with the
me-water, and thus the whole of the lime be converted into the in-
nate, which would readily separate from the water by precipitation.
has fully confirmed the simple theory above referred to.

Clark, in evidence before the General Board of Health, states:—

se of the East London water, I found the hardness $16\frac{1}{10}^\circ$, the alka-
It may be interesting to mention, that having kept the water for a
open vessels in a large laboratory, the hardness fell to $15\frac{4}{10}^\circ$. By
ater of $16\frac{1}{10}^\circ$ of hardness with lime-water, in the proportion of 4
-water to 44 of the original water, I found the hardness reduced to
ther trial, in the proportion of 4 to 45, the hardness became 4°. In
ials, when the hardness of the water was 15°, I found the purified
hardness was $14\frac{2}{10}$, the purified was 4°. In one case, when the
$14\frac{4}{10}^\circ$, the purified was $3\frac{1}{10}^\circ$. The general result was 4° of hard-
rified East London water."

cipitation of the lime and the consequent softening of the water are
ffects produced by the addition of lime-water; much of the organic
t is thrown down at the same time with the lime, a result of con-
rtance.

y of lime-water necessary depends, of course, upon the quantity
s present in any water. As it is better to use rather too little than
e-water, the proportion to be added to Thames and other river
to London may be stated at about a twelfth.

ess, although highly ingenious and useful, entails trouble, we fear
o be expected that the public at large would be induced to have re-

dition of Oxalate of Soda or Ammonia to Water.—The use of
nonia or soda has lately been recommended for the removal of the
er to be used for washing purposes.

Holland, in reply to questions by the General Board of Health,
wing evidence on this subject:—

ny danger in using the oxalate of ammonia or soda?—Not the
common care; the water does not require quite two grains of oxalic
t, to precipitate all the lime it usually contains. None of this re-
ion, and if a slight excess should accidentally be used, no harm is
ral oxalates being innocent; nay, even a small quantity of oxalic
y diluted, would be quite harmless.

oxalate of ammonia prepared for convenient use?—By dissolving
(480 grains) of oxalic acid in a quart of water, and adding as much
mmonia as will saturate it. Until the acid is saturated, the addi-
rbonate will be accompanied by effervescence; if somewhat more
vill be advantageous rather than otherwise. This quantity ought
ore than *3d.*, and would soften above thirty gallons of water. A
nful of the solution is enough to precipitate the lime contained in
mes water; less, indeed, will be sufficient, if part of the lime be
previous boiling. More ought not to be added if the water is to
king tea, as more will give a taste like that of soot.

commend this mode of softening water for washing?—It answers
I think the use of caustic soda still better, if cautiously employed.
which is a carbonate, is rendered caustic if a solution of it be
me quick-lime, which unites with the carbonic acid, and leaves
It must be kept from the air to preserve it caustic, and used
the clothes will be injured by it.

hemical expedients enable you to avoid the evils of hard water?
tent they enable those who have sufficient knowledge and care to
ils. It is idle, however, to expect that the population generally

can employ such processes as I have described, properly; or even if they co that they would do so regularly. It is evidently the duty of those who have supply a large population with water, to procure the pleasantest, softest, a purest water which is obtainable at any reasonable expense."

On the Effects of Boiling on Water.—The effects of boiling on water a very numerous; the chief, however, are the expulsion of the oxygen con tained in it, as well as of the excess of carbonic acid, which holds the earth salts in solution; this causes the precipitation of the salts of lime, and the con sequent softening of the water: for these effects to be produced fully, it necessary that the boiling should be long continued.

Professor Clark gives the following evidence on the effects of boiling o water:—

"Connected with this water, I may mention that all water holding carbona of lime is softened by prolonged boiling. There is a misapprehension, however in regard to the effect of boiling; a short boiling has very little effect indeed i softening water: when you subject water to even a sharp boiling, under th most favourable circumstances, I find two hours and three quarters, or thre hours, necessary for decomposing all the bicarbonate of lime, precautions bein taken to prevent any evaporation of water in the form of steam. By boilin this water was reduced to $3\frac{7}{10}$°. In the case of the New River water the har ness was $13\frac{2}{10}$°, the alkalinity was $12\frac{5}{10}$°; this purified by lime-water, in th proportion of 3 to 40, was reduced to $3\frac{7}{10}$° of hardness; by prolonged boilin it was reduced to $3\frac{6}{10}$° of hardness. I got another specimen of New River wate $11\frac{6}{10}$°, which, by using the proportion of 1 of lime-water to $14\frac{5}{10}$° of the wate was reduced to the hardness of $2\frac{6}{10}$°.

"At University College a large boiler of water, being kept heated for t hours and a half, showed $8\frac{2}{10}$° of hardness. [There is a very remarkable f that I have observed on the comparative result of the process of prolong boiling, and of the process of softening by means of lime-water. Both proces result in nearly the same degree of hardness, but the lime process gives a re much less alkaline than the boiling process, although the contrary might h been expected.]"

Other effects of boiling on water are, to dissipate the greater part of noxious gas which may be contained in it, as well as to destroy the vital of the living animal and vegetable productions which may happen to present.

It is to the precipitation of the earthy carbonates that the incrustation wh takes place in kettles, boilers, and pipes which convey hot water, is due. In case of steam-boilers, this accumulation often results in fatal accidents.

On the Addition of Acids to Water.—In a previous part of this Report, has been shown that the kind of living productions contained in imp water are dependent, not only upon the quality and quantity of dead org matter present, but upon the reaction of the water, whether it be alkalin acid.

Thus it was evidenced, that if water contain much animal matter in a f condition, and exhibit an alkaline reaction, the living productions present i will consist principally of infusoria.

Also, that if the same water be rendered acid, then little or no developm of infusoria will take place, but fungi principally form in it.

It was stated, further, that while alkaline waters, containing much animal matter, smell offensively, and betray evidence of progressing decom sition, acid waters, on the contrary, evolve little or no odour, the proces putrefaction in them being much retarded.

From these facts it has occurred to us that a practical application of m importance might be deduced.

Thames water, within some miles of the metropolis, holds in solution a l quantity of fluid animal matter; it swarms with infusoria, exhibits an alka reaction, and when kept for any length of time it emits an offensive sm indicative of decomposition.

Now, if to this, or any other water resembling it, we add a small quantit acid, these changes will be arrested, the animalcules will be killed, and the will soon cease to smell disagreeably.

The best acid probably which can be employed is the acetic, and the quantity added should be just sufficient to impart an agreeable, refreshing, and slightly acid taste.

We recommend, therefore, to all persons who have the great misfortune to be supplied with Thames, or any other water which approches it in character, the adoption of the simple and inexpensive proceeding here described. In times of epidemic visitations, this precaution should on no account be omitted, and we anticipate, from its general employment, results of a highly satisfactory cha- acter.

The benefits which may be expected to follow the adoption of the proceeding recommended may be estimated by a consideration of the following important ct—viz., the immunity of those districts from cholera in which the acid bever- e, cider, is generally drank.

IMPURE WATER A SOURCE OF DISEASE.

Ve now approach the consideration of a very important division of our sub- —viz., the evidences which exist in proof of the statement that impure water source of disease.

hat the air of the country is more healthful than that of towns and s is admitted by all, and that vitiated or impure air is capable of affect- the health injuriously, and of giving origin to diseases, is universally wed.

ow we have shown, that whatever the air contains in the shape of impurity, water imbibes in certain proportions; and from this single fact it must be itted that water may and does frequently prove a source of disease, for that ch is true of air out of water can scarcely be less true of air imbibed by er.

ow the effects of vitiated air are usually slow and insidious, but not on that unt the less important or the less to be guarded against; and analogy leads o believe that the bad effects produced by impure water, excepting those ch occur during the prevalence of epidemics, are of the same slow and in- ous character.

isease occasioned by the Earthy and Alkaline Impurities contained in Water.

he whole of the waters in use in this metropolis and its vicinity are of the termed *hard.*

ow, as has been repeatedly stated, the hardness of water is dependent prin- lly upon the earthy bicarbonates contained in it, but not entirely, as free onic acid, and the sulphates also, to some extent, when present, contribute to hardness.

ut hard waters usually contain other salts, as the chlorides and alkaline car- ates; these last possess the property of imparting softness to water, so that degree of hardness and the amount of those salts which impart that quality, o means, as a general rule, indicate the whole quantity of the saline consti- nts of water.

hus the degree of hardness of *Thames* and other *river waters* supplied to the ropolis varies from 11° to 18°, but the gross amount of saline matter to the on ranges from 20 to 24 grains. In *well waters* the quantity of earthy and line salts present is subject to the greatest possible variation.

he waters of *Artesian wells* are only of from 4° to 6° of hardness, but they tain, in addition to the earthy, alkaline salts, frequently to the extent of 40 ins to the gallon.

astly, the hardness of some well waters in use, mounts so high as to 50° and s 60°, also with variable proportions of the alkaline salts.

ow, allowing *two quarts* of Thames or other river water to be the average y quantity consumed in some form or other by each person, there is in- uced into the system every day ten, twelve, or more grains of earthy and line salts.

n the same quantity of the waters of Artesian wells there is contained from en to twenty grains of alkaline salts, with the addition of a very small quan- only of earthy salts.

While in a half-gallon of the waters of some wells as much as half a drac of saline matter is present.

When it is remembered, therefore, that about five grains of the earthy or alk line carbonates constitute a medicinal dose, the conclusion is indisputable t the amount of those salts contained in the waters now in use is sufficient to p duce medicinal action, and therefore in some cases to affect the health.

So convinced of this fact are many physicians, that it is their practice derangements of the digestive and renal organs frequently to prescribe distill water. This practice was extensively adopted by the late Dr. Prout.

In health the urine exhibits an acid reaction; but a very large proportion those who are out of health, and who are suffering from debility, pass feel acid, and more generally alkaline urine.

Now, there can be no question but that the daily use of alkaline waters, whi those now supplied to London really are, as is shown by their action on redden litmus paper, tends to perpetuate this condition of the urine, and to prolong th stage of debility.

This view of the action of the waters at present in use, we are satisfied, is very important one.

Another serious and well established result of the use of hard water is t liability incurred to the formation of calculus, especially calculi of lime.

In proof that the above statement of the effects of the daily use of hard a alkaline waters on health are not over estimated, we will now proceed to quo medical evidence.

In Dr. Sutherland's report on water, contained in the Appendix III. of t Report of the General Board of Health on the Supply of Water to the Metr polis, Dr. Leech gives the following evidence :—

"It has been observed, that since this change urinary diseases have becom less frequent, especially those attended by the deposition of gravel. So far experience has gone, my own opinion is, that dyspeptic complaints have becom diminished in number. With the same reservation as to time, it is the opini of the medical profession that fever has numerically diminished, and that t cases that occur are more amenable to treatment, by the use of the soft-wat supply, than they were with the former supply.

"During the late cholera there was a remarkable circumstance which deserv notice as compared with the epidemic of 1832. Since the former period, t population of Glasgow, south of the Clyde, has nearly doubled; and with th exception, and the introduction of the soft-water supply, the circumstances mig be considered as the same at both periods. In one district, the parish of Go bals, the attack in 1832 was fearful; while Glasgow, north of the Clyde, al suffered severely. During the late epidemic, Gorbals parish furnished co paratively a small number of cases, while the epidemic in other parts of Glasgo was very severe. The unanimous opinion of the Medical Society was, that th comparative immunity was to be attributed to the soft-water supply."

In the same Report, Dr. Paton, of Paisley, gives nearly similar evidence.

"I was not in town previous to the filtered river water being used, but in the first ten years of my practice here, from 1827 to 1838, cases of calculous dis orders were very numerous; the last ten years I have seen few or none, unles a few old cases previously affected, or in parts not accessible to the water of th company, and a few from some of the chalk counties of England. With regar to the time previous to the introduction of the filtered river water, which mu have been about 1804 or 1805, I can communicate nothing of my own knowledge; but from frequent conversations with my partner—the late Dr. White of this place, who had been upwards of fifty years in practice when I joined hi —I was given to understand that the cases of stone were very numerous. Th same thing was often mentioned by other old practitioners. They also mentioned the rapid diminution of them after the river water came to be used i part, and now there is not a single case of calculous disease, except those previously mentioned."

But there is also some evidence to show that the diffusion of fever and choler are also favoured by the use of hard water.

On this point Dr. Paton makes the following important observations :—

"Cholera appears, during this last and former attack, to have been man severe in those places where the water is obtained from calcareous wells, or where it is impregnated with other mineral matters, than in those places where it issues from wells over trap, or where it flows over a rocky soil of that nature. . . . I may mention that in Charleston, a district of Paisley, standing higher and possessing purer air than most of the town, and containing about 4500 inhabitants, mostly supplied with water from wells, and not from the company, cholera made its most severe attack, hardly missing a family, except a few who were supplied with pure water. . . . When cholera prevailed, I attended many cases of diarrhœa, particularly in the parts of the town supplied with wells."

And again, Dr. Paton remarks, in commenting upon the Report of the Local Board of Health in Paisley—

"You will perceive that where pure water has been supplied there have been only 346 cases of fever during twelve months; and where it has not, the numbers have been 502. This difference is not so marked; but when it is considered that the larger number comes from one-tenth of the inhabitants, and the smaller from the remainder, it is then fully seen what is the value of the pure water."

Disease occasioned by the Metallic Impurities contained in Water.—Numerous are the cases which have been recorded of serious and even fatal results following the use of water containing *lead* in solution.

Since it has been shown that many hard waters act energetically on lead, the presumption has become extremely probable that many obscure affections and attacks, especially of colic, are really to be referred to the lead introduced into the system through the water.

It is to be remembered that lead is one of those substances which accumulate in the system, so that although a very minute quantity only finds its way into the body each day, yet after the lapse of weeks or months, the accumulation may be so considerable as to produce disease.

The amount of *iron* present in the London waters is but very small, and scarcely sufficient in itself to occasion disorder.

The effects of even very minute doses of this metal on some nervous and susceptible constitutions is extraordinary.

Disease occasioned by the Organic Impurities of Water.—In proof that water highly charged with decomposing organic matter frequently gives rise to severe and fatal diseases, often of an epidemical character, we shall be able to produce an abundance of evidence.

To occasion these effects, it is probably necessary that the organic matters should resolve themselves into certain deleterious gases and substances, as the *carburetted*, *sulphuretted*, and *phosphuretted* hydrogen gases, *cyanides*, &c., as well as doubtless many other lethal products, the nature and composition of which have hitherto eluded the detective powers of chemical science.

With respect to the effects produced by the living productions contained in impure water, we will quote the evidence given by ourselves before the General Board of Health.

"*Question* 130. What are the observed effects of the consumption of the various forms of animal and vegetable life present in water on health?—The fact of the existence in large quantities of living productions belonging to several distinct divisions of the organic world, and for the most part entirely invisible to the common eye in the waters in general use, was not, I believe, generally known until announced by myself in the pages of "The Lancet" some time since. It is therefore scarcely to be expected that there should as yet have been made many observations tending to show the effects of their consumption upon health, nevertheless, we are not altogether without data upon which to found an opinion: thus the organisation and mode of life of many of these productions, as the *entomostraceæ*, most of the *infusoriæ* and *algæ*, are such as clearly to unfit them for any prolonged existence in the human stomach and intestines, and there is no question but that when introduced therein they speedily die, the digestible portions of them being assimilated; but whether this is the case with the *fungi*, the *annelidæ*, and certain *infusoriæ* and *algæ*, admits of doubt. It is a well ascertained fact that the *fungi* have the power of attacking and even proving fatal to many vegetable and the lower forms of animal life.

I may here refer to certain experiments which I made some years since to te the aggressive and parasitic powers of *fungi*. Many fruits, such as apples, pear and peaches, and several vegetables, as the lettuce, vegetable-marrow, potat haulm, &c., were inoculated with the sporules of *fungi*; the result of this w that they all became speedily diseased, and in a few days many of them entirel disintegrated and destroyed. It is to be observed that these experiments wer made on healthy and growing fruits and vegetables; the former were still o the trees, and the latter rooted in the earth. In the softer fruits, as the peac and some kinds of apples and pears, the effects of the inoculation became visibl in less than twenty-four hours, a dark spot, like that of mortification, first appearing, and this gradually extending in all directions until the fruit becam completely disorganised. There are now also many recorded cases in whic *fungi* have attacked the living animal organism, including even man himself the disease, muscardine, which occurs in the silk-worm and many other animal of the same class, as well as the peculiar softening which the tails of fish confine in glass globes frequently undergo, is attributable to the growth within the tissu of the animal of ramifying filaments of *fungi*. Again, *fungi* have been notice growing on ulcerated surfaces in the human intestines in cases of fever; the have likewise been observed in certain affections of the skin, and in discharge from the stomach, bowels, bladder, and vagina.

"With respect to *annelidæ*, it is commonly known that several species o worms live in the human intestines, and even grow and multiply there, greatl to the detriment of health, and it is difficult to avoid the conclusion that they ar really introduced from without, either in the water, or through the medium o the food.

"Animalcules widely differing from each other have also been observed to occu in the human organism in connection with certain diseases. Thus Donné ha figured and described a vibrio, under the name of the venereal vibrio; the same observer has likewise noticed in vaginal discharges *infusoria*, which he has named *trichomonades*, and which, as well as the vibrio, are figured in my work "On the Microscopic Anatomy of the Human Body in Health and Disease." Other animal productions have been noticed in the humours of the eye, in the muscular tissue, gall bladder, &c.

"The only instance of an alga being found in connection with the human subject is that recorded by Dr. Arthur Farre; it was observed in a case attended with vomiting, and has been named *Sarcina ventriculi*. It is particularly worthy of observation that the greater part of the living productions noticed in relation to man have had their seat either on the surface of the body, in the stomach, intestines, gall bladder, or in the urinary passages, uterus, and vagina; that is almost invariably in positions accessible to the air, an observation leading to the conclusion that they found their way into the frame from without.

"*Question* 131. The *diatomaceæ* are, I believe, furnished with skeletons of silex; what becomes of them when introduced into the stomach, and is it probable that they could give rise to results injurious to health? — The vitality of the *diatomaceæ* is most probably destroyed when introduced into the system: they pass, however, in an entire state, and when consumed in any quantity, it is quite possible they might give rise to irritation, in consequence of their unyielding nature and of the elongated and needle-like character of most of the species, the extremities of the frustules frequently being finer and sharper than the points of needles."

In reference to the general effects resulting from the use of water containing decomposing organic matter, Dr. Gavin, in evidence before the Board of Health, states: —

"The connection between foul drinking-water and cholera was established by irrefragable evidence. The cases where the connection was most clear were where the parties had been recently drinking water taken from pumps near and contaminated by the matter of, cesspools; but wherever the water was c taminated so as to be nauseous, diarrhœa was invariably present, and affe every person in the habit of drinking such water. I am not aware of any exceptions to this law. The most aggravated instance of foul water develo cholera was where a thirsty navigator drank of the Hackney-brook (a com sewer), and was almost immediately attacked with cholera, and subsequently

ied. The cases next most marked were those of the eleven persons,
nty-two in number, whom I have already recorded as having perished
in square consisting only of a few houses, where the water was con-
with cesspool water. A similar story I have related with reference
st outbreak of cholera at Fulham. In Hackney I have shown how,
y-three inhabitants of one locality who drank of water contaminated
ool matter, every one had had, or then had, more or less diarrhœa, and
oid its excessive filthiness the whole of the inhabitants of that row were
to drink and use for domestic purposes the water which ran down the
These are the more marked instances, but the cases where foul water
development of cholera were so numerous, that all the visitors under
ntendence united in their testimony as to the influence of such water
elopment of the disease. I have traced in many instances the unsus-
use of the development of cholera in the state of the drinking water.
s recollected that the water of the poor is nearly always exposed to the
ases and agencies which arise from privies, and the slow decomposition
fuse in their yards, and also from those in their close, offensive, and
vellings, it will at once be understood that such water produced much
e diarrhœa during the period of cholera."

wie, surgeon, gives the following testimony in reference to the pro-
f cholera from the use of impure water: —

g the raging of the cholera I met with many cases where it was
hat the badness of the water was the cause of the attack; and I have
that it greatly tended to increase the liability to disease.

well known that cholera raged with frightful and destructive violence
r Tydfil, Pen y darran, Dowlais, and other mining towns and villages
Wales; and in all these places I heard the opinion expressed by many
ulation that it was something in the water. The supply was wretchedly
and the water very impure."

ain —

water supplied to the Tower was pumped from the Thames at a certain
in 200 yards of a sewer, the contents of which were all the blood and
n the butchers' shops and slaughter-houses in Whitechapel." "The
nd all the inhabitants of the Tower complained of the water, and
a great deal of the disease to the bad water." "A regiment that
n Chichester had eighteen on the sick-list three days after their
The sickness on that occasion was likewise attributed to the impurity
ter.

cases of cholera in the Tower were considered more malignant and
n in the worst parts of the Metropolitan Eastern District."

idence of Mr. Challice, surgeon, is nearly to the same effect.

irst fatal case of cholera that I met with was that of a master of a vessel
send. He was a fine man in the prime of life, and in perfect health
eft London. He was going to the Baltic; he drank rather largely over
rting with his owners and others, and he got up in the morning and
artily from one of the water casks, which had just been filled with
water; he was soon after attacked with purging and vomiting. I went
t, and found him just dead. I asked particulars, and I found that
was so sudden, that it almost appeared as if he had taken poison in
. Subsequently it was from facts that came almost hourly under
at I formed the opinion of the direct consequences of taking impure
producing a disordered state of the bowels, and those who had such a
he bowels were pre-eminently in a condition to become victims to the

arles Martin, surgeon, gives the following evidence, in reference to
Jacob's Island, Bermondsey: —

k in the greater number of houses there was no water to drink but
the tidal ditches, until about July. At that time a great supply of
laid on. It had been getting worse for years past; the water in the
ecoming in some parts absolutely putrid, green, thick, and slimy. I
e clusters of houses where they had only such water to drink, and I
t out of five of those houses the inmates of four were affected with

cholera. In all the early cases of cholera, the parties were found to h
supplied with water from these ditches. One case was that of a man fro
stone, who stayed at a public-house in Mill-street for the night, on hi
Liverpool, to emigrate: he arrived on the Saturday, and on Monday was
with cholera. In that house no water was laid on; great numbers of th
in the neighbourhood are still not supplied with water."

Testimony similar to the above, showing the connection between
water, cholera, fever, and other diseases, might be multiplied to al
extent; enough, however, has been advanced clearly to establish the re
question.

SECTION II.

THE DIFFERENT KINDS OF WATER.

All waters are either soft or hard.

The *soft waters* are distilled, rain, and snow water. They are all char
by the following properties: when used in washing they communicat
hand a feeling of softness; they do not curdle soap; they are free fro
impregnation; they permeate readily all organic tissues, whether living
and they possess highly solvent and extractive powers.

Some waters are occasionally called soft, which do contain a small qu
saline matter; such waters, however, are not absolutely soft, but ar
comparatively so.

Again, other waters contain a certain proportion of alkaline salts;
these have the property of imparting a softness to water, such waters
frequently termed soft, although in general they are only relatively
strictly considered, ought usually to be described under the head of har

The *hard waters* are river, well, and most spring waters.

They are all characterised by the following properties: they commu
feeling of hardness to the hand in washing, they curdle soap, contain mu
matter, are less readily imbibed by organic tissues, and they possess less
and extractive powers.

The acids and salts which communicate to water its hardness are,
and sulphuric acids, as well as the earthy bicarbonates, to which, in mo
it is principally due.

The hardness of water varies from 1° to 60° and upwards.

Soft Waters.

Distilled Water. — This varies in quality according as the wat
which it has been distilled is pure or not; if impure, then the distill
procured from it will also be more or less impure, but if pure, and f
all organic contamination, then the product of its distillation will lik
pure.

Pure distilled water contains only the chemical elements of wate
oxygen and hydrogen, and is entirely free from gaseous, saline, met
organic impurities and contaminations.

Such water, contact with the atmosphere being prevented, will keep fo
and years, at the end of which time it will not smell in the least degree
nor will it contain a trace of organic matter dead or living.

It should be remembered, however, that distilled water is pre
London, frequently from corrupt Thames water, and is then always
nated with more or less organic matter, and consequently will not kee
lengthened period.

The purest distilled water even, if exposed for some time to the atm
will imbibe a portion of oxygen and carbonic acid, as well as any other
impurities, organic or otherwise, which may be present.

Rain water. — This water also varies in quality according to the loc
manner in which it is obtained.

ught near a large town or city, and particularly a manufacturing town, it
found always to contain a certain amount of impurities, derived from the
r less contaminated atmosphere which surrounds the town, and with which
escent to the earth it comes in contact. These impurities in part consist
and its constituents.

-water, however, procured in the country at a distance from houses, will
ral be free from saline or organic impurity, and will contain only a certain
t of those gases which exist in the atmosphere, as oxygen and carbonic
ith sometimes a trace of ammonia.

-water, therefore, differs from distilled water only in being aërated.

e-water.—Snow-water resembles in its properties very closely rain-
but is even still purer, because in the form of snow it is solid, and
re in its descent to the earth, it imbibes but little impurity from the
here.

Hard Waters.

r-water.—The water of a river is derived from many sources, but usually
s of a mixture of rain, drainage, and spring waters in variable proportions;
ourse it travels over different surfaces and strata, and hence as it flows
t acquires numerous saline and mineral impregnations, which cause its
es and the degree of hardness to vary in different situations.

degree of hardness of river-water varies, not only with the situation, but
ith the season, and with the proportion of rain and drainage water present.
rdness of Thames and those other river-waters with which London is sup-
ranges from 11° to 17°; the total amount of earthy and alkaline salts
ned in each gallon being from twenty to twenty-four or even more grains.
river-water contains not only saline and mineral substances, but also a
erable quantity of organic matter, dead and living, derived from the
, smaller streams, sewers, and numerous other sources of contamination,
h rivers in their course are peculiarly liable.

r-waters, therefore, *are the most impure of all waters, and contain the
amount of organic matter.*

ng and Well Waters.—The waters of springs and wells do not differ
ach other in any material respect, and therefore may be considered
r.

ng and well waters issue from the earth at a considerable distance from the
, and in their course come in contact with rocks, strata, and soils, from
hey dissolve out a certain amount of saline and mineral ingredients.

qualities of these waters, therefore, stand in relation to the surfaces with
hey come in contact.

rule, spring and well waters are harder than river-water, reaching in
nstances, to 60° and upwards.

e are some well-waters, however, which are less hard than river-water;
e water of most Artesian wells is of only 6° of hardness, but it contains,
same time, a considerable quantity of alkaline salts, which do not con-
to the hardness of water, but which, on the contrary, render it soft.

ing direct from the depths of the earth, well and spring water is exposed
ew sources of contamination, and contains usually little or no organic

freedom from organic impurity is observed particularly with deep well-
the shallow wells of towns and cities are frequently largely contaminated
ganic matter (a portion of which is converted into nitrates), derived from
t cesspools, privies, churchyards, &c.

On the Comparative Advantages of Soft Water.

what has been stated already, the reader will find himself in a position
some opinion respecting the advantages resulting from the use of soft
s well as the disadvantages attending the employment of that which is

advantages of soft water are of three kinds—dietetic, economic, and
y.

The dietetic benefits depend upon the facility with which soft water is imbibe by organic structures, dead and living, and hence it forms the best vehicle fo the introduction of alimentary substances into the living organism.

The economic advantages, as in making tea and in washing, likewise, in great measure, proceed from the readiness with which soft water makes its wa into organic structures, and in consequence of which it exerts a solvent o extractive action.

The sanitary advantages principally result from its freedom from admixtur with saline matters, which, as we have elsewhere shown, are calculated to giv rise to dyspeptic and calculous affections.

As the results of the use of soft water are of a more striking character tha might be at first conceived, we will proceed to adduce evidence on this head.

The subjoined testimony is extracted from the Report to the Board of Healt by Dr. Sutherland: —

"The following are notes of evidence obtained from Mr. Lawton, waterman t the Company: —

"All the consumers like the higher level water better than the lower lev water, because the higher level water is the softest." The consumers "want i for tea, and for washing; it makes much better tea, it uses less tea, it uses decidedly less soap. It is cheaper for washing, and there is less labour attendin it. It is preferred by the brewers, because it brews better ale. The soft water does not corrode boilers. At large tea parties the soft water is used by preference, because it makes tea cheaper and better.

Being asked, "What is the reason people pay for your water, when they ca get a supply from their own wells without paying for it?" — he replies, "Fo the reasons I have already given. These give the universal opinions of th people, so much so that the company has determined to supply all the distric with soft water on account of its being preferred."

John Manchester, a bleacher in Stockport, gives evidence as to the superi economic value of the soft water supply. He says, "Where we should us 50 lb. of alkali with hard water, we use 45 lb. with soft. Hard water takes mor alkali and soap to produce the same colour than soft water does. The saving o soap is still more in proportion."

In reply to the question, "What is your experience with regard to the use o hard and soft water for calico printing?" he says, "Soft water takes decided less drugs to produce the same colour."

"Another witness, Mrs. Unsworth, of the Mersey-inn, Stockport, stated th there was an old well in the yard of the house, from which water was drawn b a steam-engine for household use, but after having gone to this expense, it wa thought better to take the Company's water, on account of its softness. She stat that it brews better ale than the well-water, and also makes better tea, and us less soap in washing, so that it was found cheaper to use the soft water than th well-water, although the former had to be paid for.

"The town of Blackburn has a water-supply of from 3° to 4° of hardne which has been extensively introduced into factories and dwelling-houses made personal inquiries of a number of people, as to their experience of th new supply in comparison with the water formerly in use. I found the testi mony unanimous as to the superior advantages of the soft water for all culinar and domestic purposes. It was stated that it made better tea, and that it sav labour and soap in washing. A respectable chemist and druggist said that h could use no other water for making infusions, as all others were hard, a extracted badly."

The following notes of evidence will show the superior value of the soft wat supply in the local manufactures: —

"Henry Smithies — Is an engineer at Blackburn. Is acquainted with th comparative use of hard and soft water for boiler purposes; is acquainte the use of the present town water for boiler purposes. The town water i superior; it does not produce scale, which the former hard water did. hard water crusted the boilers so thick, that the crust had to be taken ou a pickaxe; the bottoms of boilers got corroded, and the rivets got eate There is no question as to the superior cheapness of soft water, becau boilers last very much longer, and require fewer repairs."

Professor Clark gives the following testimony, showing the saving effected by the use of soft water:— "With regard to the softness of water, this quality is of importance, not merely for the saving of soap to households, for the agreeableness of washing at the toilet, for the agreeableness and utility of bathing, which I account a most important practice for promoting the health of the inhabitants of a town, but also in respect of the wear and tear of linen due to hard water. Such wear and tear comes to be a very large item of expense to the inhabitants of a town. The inhabitants of London are probably not aware so much as visitors from the country are, of the amount of destruction to clothes in consequence of the hardness of the water, and the use of soda in order to get rid of the hardness. I remember an occasion, which I may mention, where the amount of wear and tear was brought out in a very conspicuous manner. Two young men, brothers, in Glasgow, were put into counting-houses, one in London and the other in Glasgow. They had each a similar assortment of shirts given to them. Some time after, when the brother in London came back on a visit to Glasgow, the lady of the house pointed out, to the wonder of her female friends, the difference there was in the wear of the shirts of the two brothers, that had been given at the same time; those that had undergone the London washing were so much more worn than the others which had been washed at Glasgow. I reckon the cost of soap consumed in London to be about double the gross water-rent. The quantity of soap consumed in England, Wales, and Scotland, can easily be ascertained from official returns. From these the consumption of every individual of the population appears to be nearly 7½ lbs., or 120 ounces, which, at 1*d.* for three ounces, or 50*s.* per cwt., comes to an expence of 3*s.* 4*d.* for each person. There are no official returns from which to give the consumption of soap in London alone; but after making diligent inquiries as to the consumption of soap in families that washed on their own establishments, and obtaining what I believed was the best information the trade could afford, I came to the conclusion that the average consumption of each person was about double in London what it was over all Britain — that is to say, 15 lbs., which comes to 6*s.* 8*d.* for each person. It is to be remembered that London is a hard-water district. The Commissioners must be aware that there are at present no very accurate data for an estimate of the water-rent paid by each person in London, but 3*s.* 4*d.* seems as accurate an estimate as can now be made. Thus 10*s.* for each person is the cost of soap and water in London — 6*s.* 8*d.* for soap, and 3*s.* 4*d.* for water. Since the soap costs twice the water, whatever be the rate of saving on soap, that rate will become twice as much when reckoned on the water. For example, if the saving, by softening the water be only five per cent. on the soap, it would be ten per cent. on the water.

"What is the total soap used in London?—About 1000 tons a month, at about 50*l.* a ton, and along with it are used about 250 tons of carbonate of soda, at about 10*l.* a ton, costing together 630,000*l.* a year."

Much additional evidence, equally interesting and striking with the preceding, might be adduced on the subject of the economic advantages of soft water had we space for their insertion.

SECTION III.

ON THE EXISTING SOURCES OF LONDON WATER SUPPLY.

London and its suburbs are supplied with water by nine different companies, each possessing the monopoly of a certain district.

The water furnished by no less than seven of these companies consists entirely of river-water, that of the eighth principally of river-water, and the ninth of a mixture of well and pond water.

These waters are all hard, and have all the disadvantages of hard water, dietetic, economic, and sanitary, which have already been fully pointed out, but which may again be briefly noticed. Thus, they are not readily absorbed by organic tissues, living or dead, animal or vegetable; they therefore do not readily extract the soluble matters contained in dead animal or vegetable substances, and they form a bad vehicle for the solution and dilution of food. They contain a variety of saline substances, some of which act energetically on lead, and predispose greatly to calculous and dyspeptic affections; regarded in an economical point of view, they are wasteful of tea, coffee, soap, soda, &c., and are highly destructive of all articles requiring to be washed.

Such is a short enumeration of the many disadvantages attending the use of even the purest hard water, — that is, of hard water free from organic matter; but in the case of river-water we have the additional evils to consider, resulting from the presence of organic matter, often in large amount, and in a variety of forms and conditions.

On these grounds alone, and without the addition of another observation, the sources of supply of at least eight of the present water companies ought to be and are condemned.

We propose, however, to extend our inquiries still further, to examine closely the particular sources of contamination to which each river from which water is obtained for the supply of the metropolis is liable, as well as to ascertain the present condition of the water of each company as supplied to the inhabitants.

The rivers which are made subservient to the supply of London are the Thames, the Lea, the New River, and the Ravensbourne; of each of these we will treat in succession.

State of the Thames. — No less than five companies derive their supplies from the Thames in a few miles of its course — viz., from between Brentford in the one direction, and Lambeth in the other. The part embraced between these places is more impure and foul than any other division of the river of equal extent.

The great source of pollution, amongst many others of less magnitude, to which Thames water is subject, is the sewage derived from the numerous villages, towns, and cities, on or near its banks.

Now sewage consists of every conceivable filth and abomination, — the waste of the kitchen, the contents of the water-closet, the refuse of the slaughter-house, the knacker's yard, the impure manufactory of every description, &c., — the offensive, disgusting, and dangerous character of these impurities being further heightened by the decomposition which they undergo in the sewers, previous to their discharge into the river.

A clear insight into the deleterious character of the matter of sewers and sewer-water may be obtained by a perusal of the following particulars, derived from our before-quoted work on the "Supply of Water to the Metropolis."

The microscope detects in most sewer-waters numerous minute and living worms, but only a very few animalculæ; much dead and decomposing organic matter, animal and vegetable; muscular fibre, derived from the fæces; cells of potato and other vegetables; husks of wheat; spiral vessels of plants; starch granules; a black, carbonaceous matter, &c.

By means of chemistry, the presence of much organic matter, in a state of solution, is detected, as well as a large quantity of sulphuretted hydrogen, to which sewer-water principally owes its offensive smell; and numerous saline, and even *animal* substances, as *bile*, *urea*, &c.

The quantity of sulphuretted hydrogen frequently present in sewer-water, and its deadly nature, are shown by the following experiments: —

"*1st Experiment.* — A given quantity of Thames water, known to contain living *infusoria*, was added to an equal quantity of sewer-water; examined a few minutes afterwards, the animalcules were found to be either dead or deprived of locomotive power, and in a dying state.

"*2nd Experiment.* — A small fish, placed in a wine-glass of sewer-water, immediately gave signs of distress, and, after struggling violently, floated on its side, and would have perished in a few seconds, had it not been removed, and placed in fresh water.

"*3rd Experiment.* — A bird, placed in a glass bell-jar, into which the gas evolved by the sewer-water was allowed to pass, after struggling a good deal, and showing other symptoms of the action of the gas, suddenly fell on its side, and although immediately removed into fresh air, was found to be dead.

These experiments were made originally with sewer-water obtained from the r-street sewer; they have since been repeated with six other sewer-waters, with the same results as respects the animalcules and the fish, but not the ; this, although much distressed, yet survived the experiment."

this fearful pollution by sewer-water, the Thames and most of its tribu- s is more or less subject in its whole course; the extent of contamination, ver, goes on increasing as the river advances, and the pollution is at its st point near to London, especially in the neighbourhood of the bridges, e the greatest number of sewers pour their filthy contents, the mingled e of a mighty city, into its reeking bed.

ood idea of the extent to which the water of the Thames, at different parts course, is polluted by sewer-water, will be obtained by an examination of llowing estimate of the populations on the banks of the Thames, and its aries, at the date of the last census.

ted Population of Towns on Thames and its Tributaries above Henley.

On Thame	11,151
Isis	66,763
Cherwell	7,144
Kennet	24,211
Loddon Blackwater	12,952
Thames	26,298
Total	148,519

Population of Towns on Thames and its Tributaries, from Henley to London, inclusive of the Metropolis and the Suburbs.

On Colne	37,659
Wey	32,537
Mole	22,733
Yelding	11,709
Brent	5,920
Wandle	22,697
Thames	2,034,499
Total	2,167,754

n this table it is manifest how very far from the required purity, particu- s respects freedom from organic matter, must be the water of the Thames ly every part of its course.

his point, however, we will not dwell, our chief purpose being to ascertain te of the river from Kew to London.

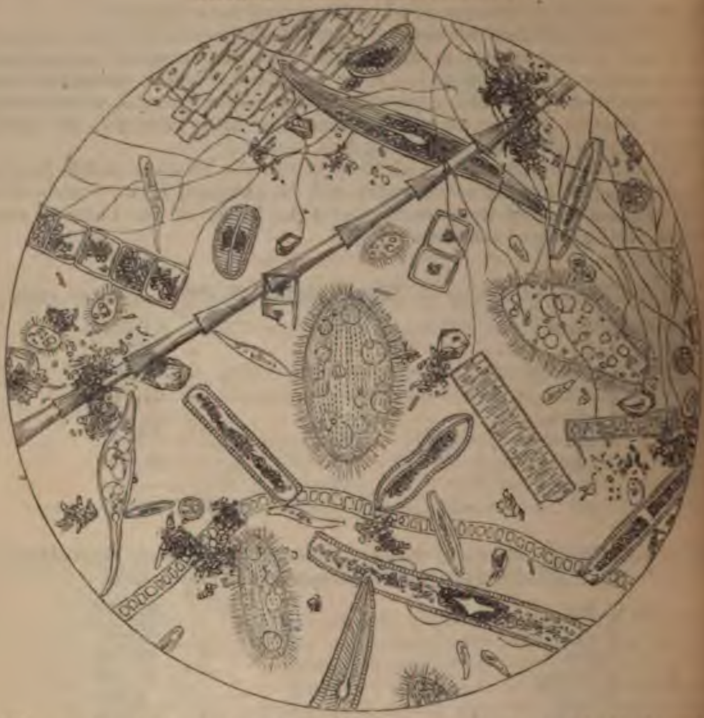
found, in a wine-bottle of water procured at Kew, and examined with the cope, animal and vegetable matter in a state of decomposition in consider- uantities; two or three species of worm-like animals, several kinds of animalculæ, confervæ, fungi, &c.

he same quantity of Thames water obtained near Lambeth, we detected an se number of living animalcules, fungi, naviculæ, &c.; also much dead c matter, the principal part of which was clearly derived from the sewers, nsisted of muscular fibre from the fæces, fragments of vegetables, cells of , husks of wheat, &c.

e differences in the results of these examinations of Thames water," "the inance of vegetation in the water from Brentford, and of animal life in ocured at Lambeth, struck me as so remarkable, that I was induced to make s of observations on the river-water, both upwards and downwards, in the of the river from London. These have brought to light the singular and ant fact, that Thames water, from Brentford in one direction, to Wool- n an opposite, swarms with living productions, principally of the genus rium, and of one species of this genus, the *P. chrysalis* of Ehrenberg.

Fig. 24.

THAMES WATER AT RICHMOND.



This engraving exhibits the principal *animal* and *vegetable* productions contained in the water of the THAMES *at Richmond*. Drawn with the Camera Lucida, and magnified 220 diameters.*

These animalcules exist in such vast numbers, that a wine-bottle of the wa obtained in any condition of the river, at high or low tide, is sure to con large quantities of them. They are met with in the greatest abundance nea London, and in the neighbourhood of the bridges. At Barnes they may detected at all times, although in diminished numbers, while at Kew they ha general almost disappeared: going in an opposite direction, we meet with in abundance at Blackwall, and more sparingly even at Woolwich. It is probable that at high and spring tides these limits are much exceeded, espec down the river; for it is to be supposed that these creatures are ultima together with a variety of other matters, discharged into the sea."†

It now only remains to state that sulphuretted hydrogen and carbona ammonia are frequently to be detected in Thames water.

The examinations of Thames water referred to above were first made in

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* The samples of water from which the engravings which illustrate this Report have been prep obtained either from the Thames itself, or from service-pipes, in February 1851.

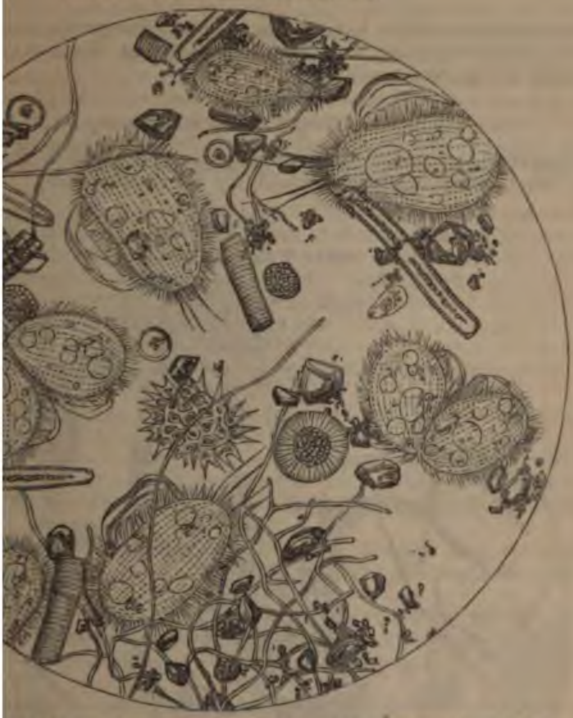
Each drawing represents *only a very small portion* of the organic matters, living and dead, contai several samples, of less than a quart each. On setting aside any water containing solid impuritie course subside, and form residues; but the living animal forms, mostly infusoria, possessing a of locomotion, diffuse themselves throughout the whole body of the water.

The forms exhibited by many of the lower orders of animals are often very singular, and we prised that they should sometimes have been made the subject of jocose and harmless remarks portant fact, however, should never be lost sight of, that the presence of these creatures, in numbers, in water, shows that it contains a *large quantity of fluid organic matter*, and *is therefor wholly unfit for human consumption*, more particularly as a beverage. Upon this point it woul a waste of words and arguments to offer another observation.

† A Microscopical Examination of the Water supplied to the Inhabitants of London and the Districts, pp. 5, 6.

Fig. 25.

THAMES AT WATERLOO-BRIDGE.



ows the more remarkable *animal* and *vegetable* productions found in the
AMES *at Waterloo-bridge*. Drawn with the Camera Lucida, and magnified

ey were repeated by us, and with the same results, in

t of animal life present in the water of the Thames near the
ependent upon the organic matter contained in it, and which
y from the sewer-water daily poured into the river; the ani-
it the means of subsistence and growth.
en, as to the present condition of the water of the Thames,
ich, is of the most conclusive character; it is clearly and
e wholly unfitted for human consumption.
ears been a matter of surprise to us how a people professing
ith a full knowledge of the fact that into the water they daily
e of the vast population of London is constantly discharged,
e senses of sight and smell furnish frequent and sufficient
content with, and continue to make use of, for any purpose,
It might have been supposed that the knowledge of such
ould have been sufficient to have raised a storm of indigna-
e present infamous system of water supply would have been
swept away.
which five of the London water companies derive their sup-
ay well be asked, how it is possible that the water furnished
c can be otherwise than highly impure? Into this point we

CONDITION OF THE WATER FURNISHED BY THOSE COMPANIES WHICH D THEIR SUPPLIES FROM THE THAMES.

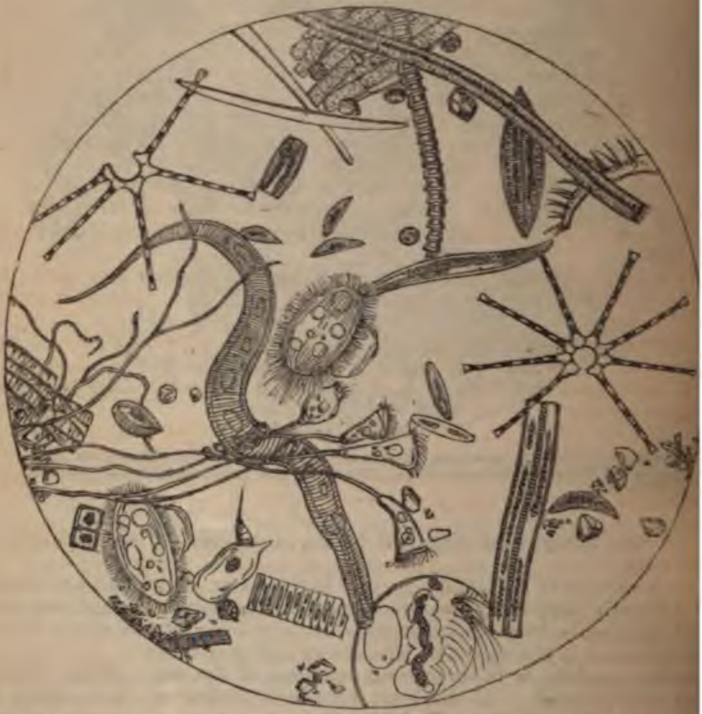
The companies which have recourse to the Thames for their supplies of are the Grand Junction, West Middlesex, Chelsea, Southwark and Vauxhall Lambeth companies.

Grand Junction Company.

From 1810 to 1821-22, this company drew its supplies from the Grand tion Canal, which is supplied mainly by the river Colne.

Fig. 26.

GRAND JUNCTION COMPANY



This engraving represents the chief *animal* and *vegetable* productions contained in the wat supplied by the GRAND JUNCTION COMPANY.

After the last-named period, however, in consequence of complaints hardness of the water, the supply was changed to the Thames.

In a statement made by the directors of this company, addressed to th of Health, the following observations occur, in relation to the cha source:—

"In changing the source of supply to the Thames, the great and wholl countable error was committed of placing the mouth of the culvert-pipe proximity to the point of confluence of the Ranelagh sewer. The con engineer of that day, under whose supervision it was so placed, certain tended that by some arrangements he had made the injury occasioned w apparent and not real, and, as the directors believe, there was truth in t gation; but the blunder was scarcely the more pardonable. It was, mo

olly gratuitous, as the works were constructed, not at the expense of the
and Junction Company, but the Regent's Canal Company, as an equivalent
obtaining the surplus water of the Grand Junction Canal, and must have
n so placed and so constructed as the Grand Junction Company should
uire. This position of the culvert was the cause or the pretext of the attack
the company contained in the pamphlet called the 'Dolphin,' and the occa-
n of the appointment of the commission of 1828 for inquiring into the state
the supply of water to the metropolis. The commissioners are aware that no
eral legislative interference ensued on the report of that commission; but as
arded the Grand Junction Company, the suction-pipe was extended so far
o the river as to be obviously beyond the influence of the Ranelagh
inage."

his "unaccountable error," this monstrous "blunder," probably entailed the
rifice of hundreds of lives; and as the result of its commission, we are enti-
l to ask—Is any body of directors, under whose superintendence such a
lunder" could be committed, fit to be entrusted with the management and
ection of affairs so weighty? But mark, reader, the nature of the miserable
edient they had recourse to by way of remedy: "The suction-pipe was ex-
ded so far into the river as to be obviously beyond the influence of the Rane-
h drainage," as if a few yards of piping afforded a sufficient protection from
the accumulated pollutions of the Thames.

But hear the directors again. "The directors believe that the company now
e a supply which cannot be surpassed."

Let us now ascertain how far this bold statement can be justified. We will
t of all express our belief that these directors but ill understand what really
stitutes a good water, or they never would have hazarded such an exagger-
d statement.

The company's present supply is taken from the Thames just above Kew-
dge, and in close proximity with the outpourings of the populous and dirty
n of Brentford.

But the Grand Junction Company filters its water, and here at least the public
some slight protection. Let us ascertain what this protection is worth.

t will be remembered that it has been stated that the best filter is no substi-
e for bad water.

Well, then, in less than a quart of this water as obtained from a service-pipe,
consequently after filtration, there were detected, by means of the micro-
pe, living species of worms, animalculæ, algæ, fungi, organic matter, grit, &c.
much for the "supply which cannot be surpassed."

West Middlesex Company.

This company takes its supply from the Thames, nearly opposite to the large
not overclean town of Hammersmith.

n reply to the question, "Is the whole of the water which is supplied filtered?"
company puts in the following statement:—"The water passes through a
t from the Thames to the western reservoir at Barnes, where the water rests
subsidence; thence through a duct to the eastern reservoir for the same pur-
e; thence under the bed of the river in a 36-inch pipe to the wells of the
ines. These reservoirs are partially supplied with water through gravelly
s. The reservoirs were constructed in the year 1838, at great cost. They
re formed for the purpose of rendering the water bright and pure at all sea-
s, by means of depuration by subsidence; and from the nature of the soil
e gravel) they have proved eminently successful."

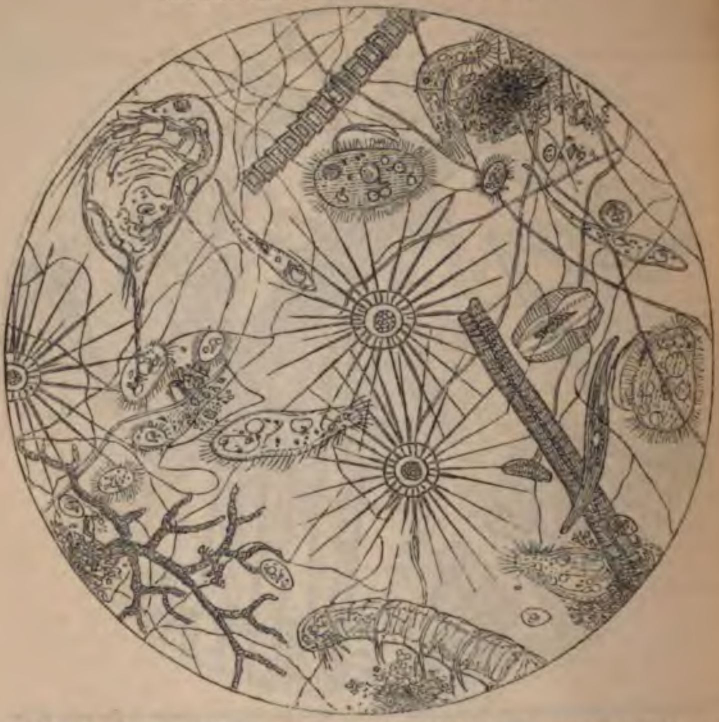
We will now examine a few samples of the water with which this company
nishes its customers, detailing the results of a single examination only.

There were discovered in less than a quart of this water living entomostraceæ,
eral species of animalculæ, especially the Thames *Paramecium*, algæ, con-
ræ, fungi, &c.

The water of this company betrays evident signs of contamination by sewage,
shown indisputably by the presence of the animalculæ so abundant in Thames
ter near the bridges.

Fig. 29.

SOUTHWARK AND VAUXHALL COMPANY.



This engraving represents the principal *animal* and *vegetable* productions contained in the water as supplied by the SOUTHWARK AND VAUXHALL COMPANY. Drawn with the Camera Lucida, and magnified 220 diameters.

sequence, that very great consideration should be bestowed on the question, whether sufficient grounds exist for resorting, at a cost which cannot be otherwise than enormous, to new sources of supply. They see no reason to believe that water, from whatever source procured, would prove more acceptable to the company's tenants than that now furnished, of which it should be distinctly understood the company receives no complaints."

We will now ascertain how far the "statement" and the "facts" of the case are in accordance.

Well, then, a sample of this filtered water, "perfectly bright at all seasons of the year," and "at least inferior to none that can be procured for the metropolis, as regards its saline ingredients," contained a very considerable number of animalcula, especially the Thames *Paramecium*, a copious sediment, evident contamination by sewage, &c. The water supplied by this company is, with one exception, the worst water in London.

What faith, again we ask, ought the public to place in the vaunting statements of the self-laudulent directors?

The Southwark and Vauxhall Company receives "no complaints," and so say also the directors of the Grand Junction Company. "Complaints," indeed! Where is the utility of addressing complaints to monopolist directors, who, in reply, will probably intimate their readiness to cut off the supply. If the "directors" do not receive complaints, the "collectors" of the rates do, as we can testify.

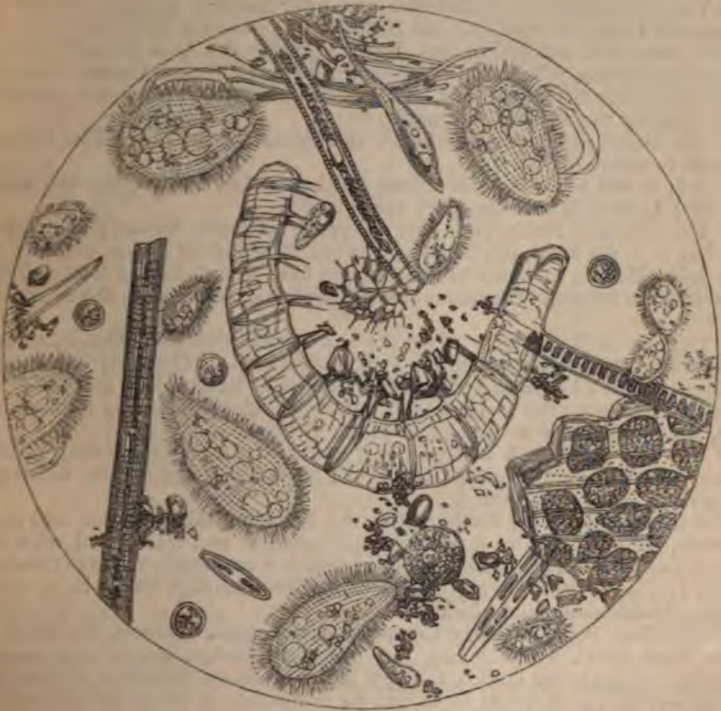
The delicate allusion to "sensitiveness" is just the very reverse of the truth; so far from the public having exhibited an over-sensitiveness, they have manifested a degree of apathy which is highly culpable.

Lambeth Company.

This company obtains its present supply from the Thames, at Lambeth; it has procured, however, the sanction of Parliament to take water from Thames Ditton, where, we believe, it has extensive works under construction, on the completion of which the supply derived from Lambeth will be discontinued.

Fig. 30.

LAMBETH COMPANY.



This engraving exhibits the *organic matter living and dead*, especially the Thames *Paramecium*, contained in the water as supplied to the public by the LAMBETH COMPANY. Drawn with the Camera Lucida, and magnified 220 diameters.

This company very properly abstains from making any laudatory observations respecting the quality of its present supply, which is, in fact, the worst in London. The water as now delivered, very generally exhibits a thick and opaque appearance, and although professing to be filtered, differs but little from Thames water itself as procured direct from the river. In it the microscope readily discovers great numbers of the Thames *Paramecium*, much organic matter, and distinct evidences of contamination by sewage.

The improved quality of the water obtained from Thames Ditton, over the present supply, will of course be very considerable. "The water at Ditton," states Mr. Simpson, the engineer, "being usually very clear, will be passed at once from the river conduit-pipes to the filters, from them to the wells of the pumping-engines, and thence through the aqueduct or main-pipe to the reservoirs. The filtering apparatus will be erected on such a principle, that the water must of necessity pass at all times through the filtering medium before it can reach the pump-well of the steam-engines."

The waters, therefore, of the five companies, which derive their supplies from the Thames in the most polluted part of its course, are condemned, not alone by their hardness, but in consequence of excessive contamination with organic matter, animal and vegetable, dead and living, derived principally from the sewage poured into it.

We have next to bestow a few remarks on each of those companies which do not procure their supplies from the Thames.

The Course and Condition of the River Lea.

The following account of the course and condition of the River Lea is derived from personal observation and examination.

"This river rises near Dunstable, and after passing through or near to the villages of Luton, Herpenden, and Hatfield, it is joined at Hertford by the small rivers, Bean Rib, and Maran, and, below Ware, by the Ash; from Ware it flows on to Hoddesden, Cheshunt, Waltham Abbey, Chingford Green, Tottenham, Old Ford (near Stratford), and on to the Thames, which it reaches near Blackwall, forming the creek of that name.

"The united population of villages and towns on the Lea and its tributaries amount to about 70,000.

"It is at Old Ford, near Stratford, and below Lea Bridge, that the works of the East London Water Company are situated.

"The nature of Blackwall Creek is pretty generally known; the waters of the Lea in it are filthy and impure; the bed of the river at low water is small and insignificant, so much so that barges have to wait for the tide, and into it is poured the refuse of the numerous manufactories situated on the banks of the creek.

"The tide of the Thames affects the Lea beyond Old Ford, that is, some two miles above the point at which the East London Water Company has its works. It does not reach Lea Bridge, being intercepted by locks, which serve the double purpose of keeping the Thames tidal waters out, and of damming in those of the Lea, which otherwise would be lost in the Thames.

"Moreover, the Lea is a barge river, and its waters are constantly stirred up in opposite directions by the passing and repassing of the barges, which go up the stream as far as Hertford.

"It is to be observed, further, that the Lea runs through a low and marshy country, liable to become flooded in rainy seasons, and intersected with dykes and ditches, the impure washings out of which it constantly receives: the water of the Lea is therefore, to a great extent, surface-drainage water, in my opinion a very objectionable kind of water.

"The East London Water Company has a communication, by means of a small open canal, with the Lea, just below the bridge, but still not out of the influence of the barge traffic; through this it professes to receive all the supply which it requires: this may be so, yet the connection of the works by flood gates with the Lea at Old Ford looks suspicious, and should be closely examined. If it does take any part of its supply from Old Ford, then undoubtedly the water is contaminated by the impurities of Blackwall Creek and Stratford, and is for the most part Thames water itself." *

East London Company.

From what has been said of the course and character of the River Lea, the reader will scarcely expect to receive a very flattering account of the purity of the water supplied by this company.

The question was asked—Is the whole of the water filtered? "No. The water supplied (with the exception referred to in answers Nos. 3 and 9) is taken from the Lea, upwards of six miles from its mouth in the Thames, and nearly two miles beyond the flow or the influence of the tide; and after passing through a canal nearly two miles in length, cut through Hackney Marshes, it is received into large reservoirs of deposit, where its impurities subside, previously to flowing into smaller reservoirs, from whence it is pumped into the company's district."

We have several times examined the water in the canal alluded to, as well as that delivered to the houses.

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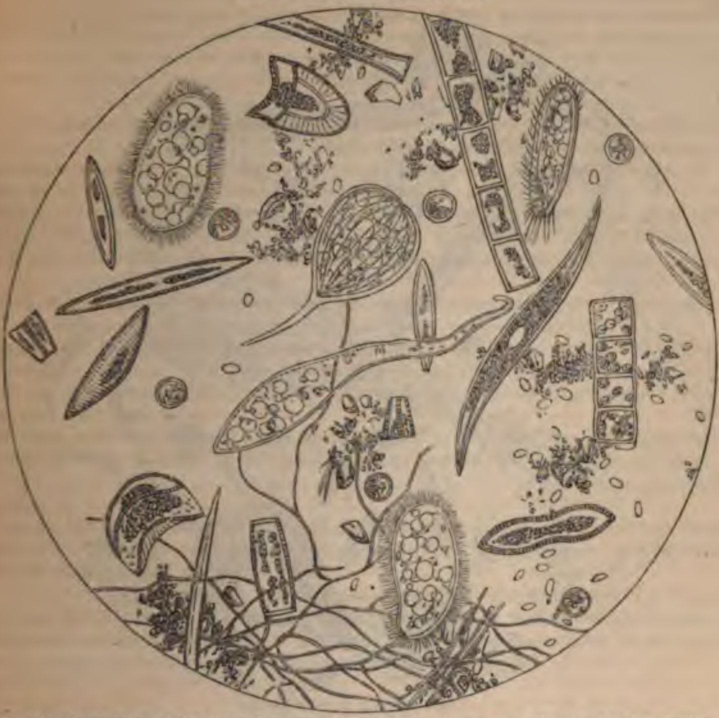
* A Microscopical Examination of the Water supplied to the Inhabitants of London and the Suburban *Districts.*

Fig. 31.
EAST LONDON COMPANY.



Sample of the water of the EAST LONDON COMPANY, showing the chief *animal* and *vegetable* productions contained in it, as supplied to the public.

The canal water we have found to be in a very impure state, and to contain very much organic matter, dead and living, including a considerable number of living entomostraceæ and animalculæ.

The water as supplied to the houses has also always been very impure, has contained much sediment, consisting of earthy and organic matter, with many living algæ and animalculæ. The neglect of filtration satisfactorily accounts for the state of this water.

The conveyance of the water at a very slow rate, for two miles, in an open canal, we consider to be highly prejudicial to its purity, as the growth of vegetable and animal productions is thereby much encouraged.

The New River, its Course and Condition.

The New River Company.

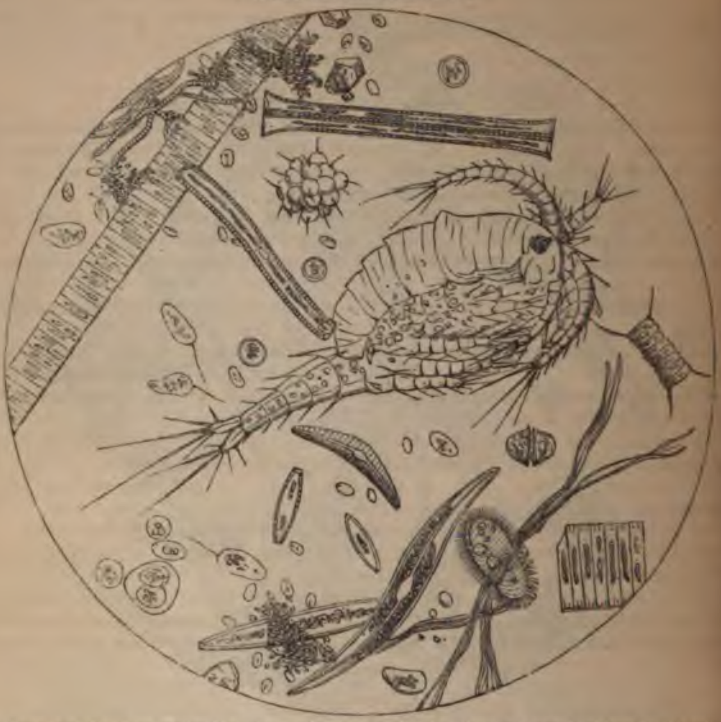
Strictly speaking, the so-called New River is not a river at all, but a canal only.

The following account of the course and condition of the New River was also derived from personal observation and inquiry.

"This company derives its supply in part from springs at Amwell and Chadwell, near to Ware, in Hertfordshire, the principal Chadwell spring forming the 'New River Head;' in part from the river Lea, as well as from wells at Cheshunt and Tottenham; it has also, let it be particularly observed, a communication with that prolific source of London water supply, the Thames, at Broken Wharf, Upper Thames-street.

"The 'New River Head' is a pool of water of some six yards in diamete entering it on one side is a small ditch-like stream, which carries water suffic

Fig. 32.
NEW RIVER COMPANY.



Sample of the water of the New River Company, showing the more remarkable *vegetable* and *animal* productions contained in it as supplied to the consumers.

into the head to keep a twelve-inch pipe supplied; while on the opposite side the water flows slowly away in a small stream of a few feet in width; this, after a short and independent course of a hundred yards or so, unites with another stream broader and apparently still more considerable than itself, which is supplied from the river Lea; the conjoined streams then pass on towards Ware.

"The 'head' of the New River, therefore, is evidently much indebted to the other members of the body corporate; the independence of the river itself soon ceases, and its water quickly loses its character of spring-water by a very copious admixture of river-water not of the purest quality,—so much for New River spring-water at Ware in Hertfordshire. We shall see whether its character improves as it gets further on its journey to London.

"The condition of the water in the little stream or ditch which assists in supplying the 'head' is very bad, it containing *Infusoria* and *Algæ* in great numbers; this is owing to the unclean and weedy state of the ditch in question.

"The condition of the water in the 'head' itself, inasmuch as it receives all the water from the feeding ditch, cannot be very satisfactory; but the margins of the 'head' are also covered with *Algæ* rising up into the water like clouds, and affording a nidus for the shelter, growth, and development of *Entomostracea*, *Infusoria*, &c.

"The canal itself near to Ware is at the present time in a much better state than I have ever seen it before.

"The next accession of strength which the New River receives is at Cheshunt; here the company has a well worked by a steam-engine, and two reservoirs; the one of these reservoirs at least contains something more than pump-water, it being fed by a small stream nearly dry in summer, but which in rainy weather contributes as well as the pump a fair supply of water.

"These reservoirs have very recently been cleaned out, and certainly the operation was much wanted, as I was given to understand that it had not been once performed before, since the reservoirs were made, nearly twelve years since.

"The cleaning out of these reservoirs, it was stated, occupied nine weeks, and employed thirty horses and not a few labourers; the matter removed consisting of a black muddy substance of an offensive smell, and similar in nature to that contained at the bottom of old ponds, and also to that which has been recently taken out of the Serpentine. This black mud I regard as a sure indication of the presence of organic matter, of which fact those who removed it from the reservoirs seem fully aware, as it has been spread over an adjacent field, to the fertility of which it will doubtless much contribute.

"Some years since, the Cheshunt reservoirs were a favourite resort of mine, and on turning to my 'History of the British Freshwater Algæ,' I find them given as the habitats of several species; their condition at that period, therefore, cannot have been very good.

"New River water, therefore, has no very distinct or peculiar characters of its own, it being a mixture of water derived from various sources.

"The water is conveyed by means of a long canal, known as the 'New River.' As it flows to London, it creeps slowly along, and this, as already explained, is one of the circumstances favouring the development of the lower forms of animal and vegetable life.

"Other sources of impurity are to be found in the fact, that the New River, along much of its course, is accessible to the public, who use it as a resort for bathing in summer, and at all times as a receptacle for refuse animal and vegetable matter.

"The quantity of *Oscillatoreæ* and *Diatomaceæ* seen floating on the tranquil surface of this canal, during the summer months, is immense, and seriously affects the condition of its water." *

The water supplied by this company is not filtered, but is allowed to "purify itself," as the phrase goes, by subsidence; the result is, that the water frequently deposits a considerable amount of sediment, and always contains more or less organic matter, including many algæ and some animalculæ.

Hampstead Company.

The Hampstead Company derives a great part of its supply from several large ponds situated near to Hampstead Heath; these are filled, partly by surface-drainage, and partly by springs, some of the ponds being evidently contaminated with sewage.

"Of these ponds, some are the property, or at all events under the control, of the company, and these are in a tolerably clean condition; others, from which, also, part of the water used proceeds, have a different proprietorship, and are in an exceedingly unclean state: thus there is a large pond in the 'Vale of Health,' full of weeds, swarming with animal life, the receptacle of some dead animals, and into which no inconsiderable amount of sewage passes; the contents of this pond, so far as could be ascertained, drain into the company's ponds. Surely the 'Vale of Health,' if it really merit its pleasant name, would be still more healthful if this baneful pond were filled in or removed, as it ought to be. There is also a large pond belonging to the lord of the manor, full of weeds, *Algæ*, *Entomostraceæ*, and *Infusoria*, and the surplus water of which also passes into the other ponds. Again, there are two or three ponds, in the domain of the Earl of Mansfield, in a weedy condition, and from which the water undoubtedly drains into the ponds of the Hampstead Water Company." *

But it must be mentioned that part of the supply of the Hampstead Company is derived from two Artesian wells, one near the Heath, and the other at Somers Town.

Now the water of most of the Hampstead ponds has been several times subjected to careful microscopic examination, and it has been found to contain precisely the same forms of animal life which were encountered in the water of the company as supplied to the public. Regarding, then, all the facts in this case, it is impossible to say that the water distributed to the public by this com-

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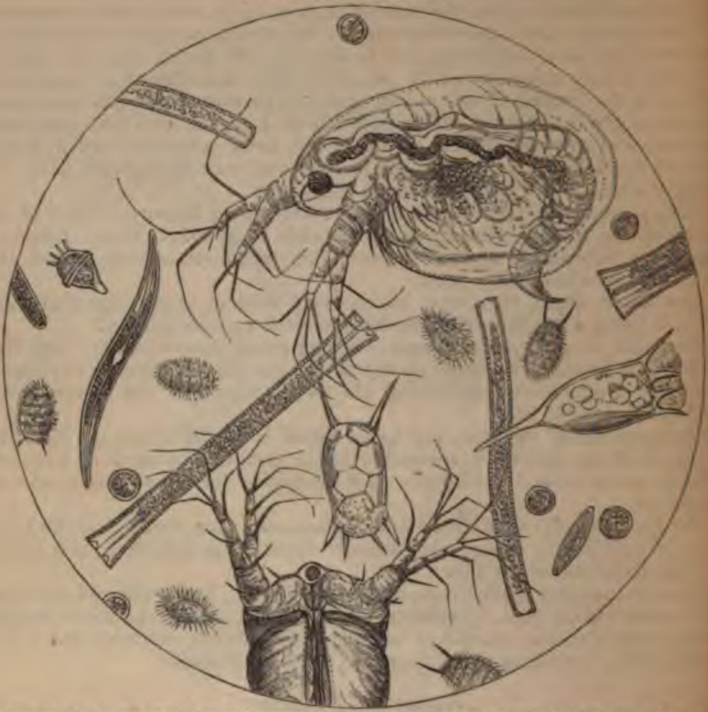
* A Microscopical Examination of the Water supplied to the Inhabitants of London and the Suburban Districts.

Fig. 33.

HAMPSTEAD COMPANY.



Sample of the water of the HAMPSTEAD COMPANY, exhibiting the principal living productions detected in it, as supplied by this company.

pany, containing as it does a large amount of organic matter, is in the conditi
which regard to health and safety demands.

At times the supply furnished by this company is either so deficient or ba
that it contracts with other companies for part of the water, and we believe th
this is the case at the present time, February 1851. This company also does
filter the water previous to distribution.

Kent Company.

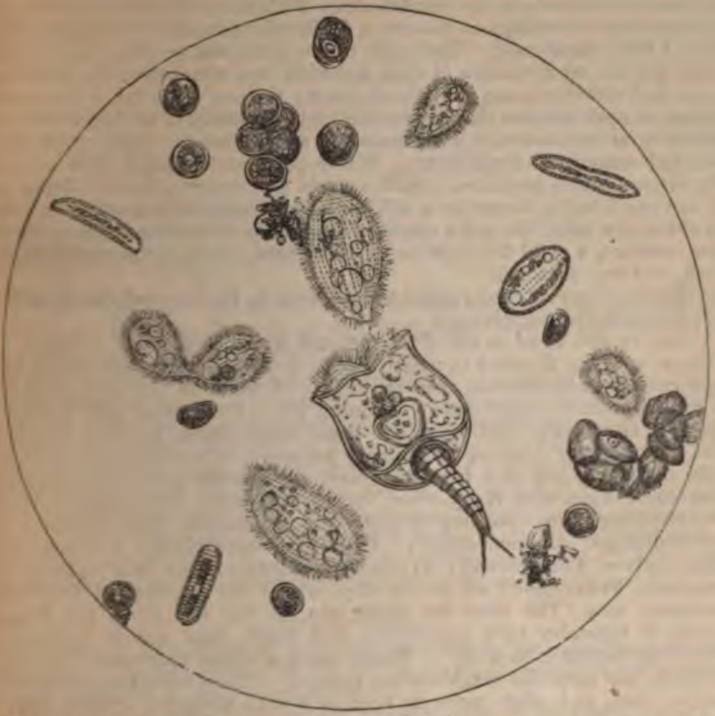
This company is supplied by the Ravensbourne, a little stream which ris
near Bromley, in Kent; and after a short course, in which it passes thro
Rushey Green and Lewisham, joins the Thames at Deptford, forming the Dep
ford Creek, which is even in a worse condition than the Blackwall Creek; be
Lewisham, a large branch, which comes from St. Mary's Cray, unites with th
Ravensbourne.

The Ravensbourne, like the Lea, receives the washings-out of ditches, and
many parts of its course is exposed to the public, and therefore to many sour
of impurity; above Deptford, and close to the waterworks, we noticed two
three dead dogs and cats.

At Deptford, and just below a large mill, there are tide-gates, which ke
the filth of the creek, it is to be hoped effectually and entirely. Notwithsta
however, this very necessary and proper precaution, the river Ravensbo
to be objected to, as a source of supply, on account of its smallness, its ex
to the public, and the consequent deterioration of its water.

This company filters the water, and although many animalcules are to
tected in the river, but few are present in the filtered water.

Fig. 34.
KENT COMPANY.



Sample of water of the KENT COMPANY, exhibiting the animalcula, &c., present in it, as supplied.

To sum up, then: the waters at present in use in this metropolis are all hard, and have all the disadvantages of hard water; they are, moreover, river-waters, and for the most contaminated to a great extent with organic matter, dead and living; add to these points the fact of their further deterioration by contact with lead in cisterns and by the accumulation and growth of animal and vegetable productions, which take place in those receptacles, and the case is proved against the whole of the present supplies of the metropolis.

Other Defects connected with the Present Supplies.

Other defects, besides the very great one of *quality*, exist in connection with the present supplies of water.

In many streets, courts, and alleys, no water has been laid on at all, but the people have to obtain it, at considerable trouble and loss of time, from what are called stand-pipes; it is then stored in pails, tubs, jars, or any other vessel which they may happen to have, and placed in the passage or a close room, from which it suffers still further deterioration.

The number of stand-pipes in London is certainly not less than 1581, with an average of about 40 persons to each.

Dr. Gavin gives the following evidence in reference to these stand-cocks: —

"What proportion of the people you visited during the house-to-house visitation were supplied by stand-pipes? — In Hackney, about half the houses are supplied by stand-pipes; in Bethnal-green, with very few exceptions, the dwellings of the poor are supplied with water by means of stand-pipes; in Shoreditch a larger number of houses have water laid on, but still the number of dwellings supplied by stand-pipes is very considerable. In a few instances, some squares, *or rows of houses, as Thorold-square*, Bethnal-green-road; the

Crescent, Hackney-road; the Crescent, Union-street, Kingsland-road, h
sunk reservoirs communicating with the main, which, by means of a pu
supply water constantly to the inhabitants. With these exceptions, all the poo
and middle-class dwellings in Hackney, Bethnal-green, and Shoreditch are s
plied as I have mentioned. The poor preserve the water either in, 1., butts
cisterns are almost unknown (I only met with two attached to the dwellings
the poor and middle classes in Bethnal-green; the one was a large covered bu
the other an open wooden cistern containing the remains of cooked fish); or,
small tubs, or earthenware jugs, pans, or sometimes in small crockery-wa
bowls, and sometimes soup-plates. Water preserved in such tubs or pans
nearly always taken in-doors. Such vessels are never covered. Even wh
there are small butts, the water is still preserved in-doors in small open vessel
when there are tubs, the tubs are very frequently stowed away below the bed
In one instance, a child fell into one of these tubs, which projected from belo
the bed, and was drowned."

Mr. Bowie, surgeon, thus replies to questions by the General Board of Healt
relating to defective supply—

"You have also acted in aid of the General Board of Health? — Yes.

"Were you not directed to make special inquiries on the part of the Metr
politan Sanitary Commission as to the supply of water in the City of Londo
Will you explain in what state you found it? — In general very scanty, a
sometimes altogether wanting. The water often thick, muddy, discolour
putrid, and unfit for drinking or culinary purposes. I would instance, as pro
of this statement, out of a host of others, the houses in Fireball-court, Th
Pigeon-court, Cock-and-Hoop-court, Seven-Step-alley, Houndsditch; Crow
court, Seething-lane; Barking-churchyard; Rose-lane, Tower-street; Pe
terers'-buildings, Cannon-street; Printing-house-square, Coleman-stre
Saddler's-place, London-wall; Ivy-lane, Newgate-street; Mac's-place, Gr
stoke-place, Fetter-lane; all in the city, where the inhabitants thus expr
themselves: that 'The time the water was on was too short, the fatigue
carrying it up-stairs very oppressive, and much time lost in procuring
'There was no water laid on.' 'Water was got where they could, by beggi
borrowing, and from the neighbouring pumps.' 'They have been without wa
for eight years, and often more in need of it than victuals.' 'They have b
without water for nine years.' 'The water is dipped with pails, and is of
very dirty.' 'The water, instead of being clear and fit to drink, often lo
quite yellow.' 'The water in the cistern is only fit to rinse a pail, or cleanse
privy, as every impurity gets into it. It has even been used for drowning kitte
Two open tubs stand behind the door of the kitchen as water-butts, and ha
only been cleaned out once in the nine years.' 'The water (supplied fro
pump) is shockingly bad, tasting as if they were drinking something putrifi
and often containing live worms more than an inch long, supposed to be fr
the burying-ground at the back of the house.' In addition to this, a gully-h
is in close connection with the pump, by which foul water may find its way i
the well. There is an evil of considerable magnitude likely to result from
practice of having public pumps or stand-cocks to supply a neighbourhood w
water. It is, that as children and females have to go and wait their turn, th
may come in contact with persons of the worst character, hear bad langua
have their sense of delicacy impaired, and at last become regardless of decenc

In many localities, again, water has been laid on to houses which have
been provided with drains; the consequence of this is, that the waste water si
into the soil about the house, rendering it damp and unhealthy.

It is not man only who suffers from defective supply of water, but the p
beast also; thus no adequate accommodation has hitherto been provided for
supply of cattle of all descriptions with that necessary, water; this want is p
ticularly manifest on the various roads leading to the metropolis, on which
constantly be seen droves of sheep and oxen making their weary way to
great city.

How often have we not been pained to see the poor, over-driven beast, foam
and panting, lying down in the road, ready to expire with fatigue and thi
without the possibility of a drop of water being procured. The only sourc
supply on these occasions is the pump or tank of the publican, and he of co

those who use his water to pay for the accommodation, usually in
of beer.

reat evil of which we now complain will of course be much lessened
t gigantic nuisance, Smithfield, is done away with, as there is now good
believe that it will be speedily; but even in that case a public and un-
pply of water on our great thoroughfares will be required for dogs and

tention has been particularly directed to this subject by certain bene-
lies, whose sympathies are always readily enlisted in favour of suffer-
y form; and in accordance with a promise given, we now raise our
ehalf of the poor dumb beast, which has no power to make known or
its own necessities.

lowing are the experiments previously referred to, showing the action
some of the waters now in use.

its showing the Action of certain Waters now in use in this Metropolis
l, as Thames, Hampstead Well and Pond Waters, and the Water of
sian Well at Trafalgar-square.

ults obtained from these and the other experiments already detailed
highest importance, and not merely sufficient to set at rest for ever
on of the comparative action of soft and hard water on lead, but they
y show how dangerous is the employment of that metal in any form
on with the present water supplies of this metropolis.

rable as was the quantity of lead taken up and dissolved by each of
waters experimented with, the amount would, no doubt, have been
ter had pieces of lead presenting a larger surface been employed, and
ters, in place of being included in sealed vessels, been freely exposed
osphere, as in the majority of cisterns they constantly are.

1st *Experiment.*

iece of lead, about an inch long and half an inch wide, was placed in
ontaining ten ounces of Thames water, procured at Waterloo-bridge,
exhibited an alkaline reaction.

—At the end of a fortnight the lead appeared but little acted upon,
surface only presenting a slightly dullish aspect.

—At the expiration of the time above referred to, sulphuretted hydro-
passed through a wine-glass of the water, the liquid became *decidedly*
l, and exhibited the brownish hue characteristic of the presence of

2nd *Experiment.*

r piece of lead was placed in contact with the same quantity of water,
rom the Artesian well at Trafalgar-square; reaction alkaline.

—The metal at the end of a fortnight appeared somewhat dulled.

—On the application of the sulphuretted-hydrogen test, the water
ickly and *more decidedly discoloured* than in the previous experi-
eing turned quite brown.

s.—The water of this, and, indeed, of most Artesian wells, contains a
ortion of alkaline carbonates and chlorides, both of which, by previous
ts, have been shown to act strongly on lead.

3rd *Experiment.*

experiment the lead was placed in contact with water obtained from
ell at Hampstead, from which the Hampstead Water Company pro-
rt of its supplies. Reaction slightly alkaline.

—Metal a good deal dulled, with a small quantity of the oxide
o the bottle.

—The effect of the application of the sulphuretted-hydrogen test was
decided, the liquid assuming a blackish tint.

s.—Mr. Squire, her Majesty's chemist, who has paid much attention
ject of water, and who has analysed a considerable number of the
l well-waters, informs me that the water of the company's well is

constituted very much like the Trafalgar-square water, and is, indeed, rather softer of the two — a fact which satisfactorily explains its powerful action on lead.

4th Experiment.

In this case water from one of the Hampstead ponds, from which, also, the Hampstead Company derives part of its supplies, was employed. No reaction with test-paper.

Results. — Metal at the end of a fortnight slightly dulled only.

Tested. — The water on the application of the test became *less deeply coloured* than in the former case, but still very decidedly so, indeed, to nearly *an equal extent with the water of the Trafalgar well.*

Remarks. — The results of Experiments 3. and 4. are in accordance with common observation: the strong action of the water of the Hampstead Company on lead has long been known to plumbers. The effects produced by the pond water, which is very hard, are principally due to the earthy carbonates.

Experiment showing the Action of the Soft Bagshot Water on Lead.

5th Experiment.

A piece of lead of the same size as that employed in the previous experiments, was placed in a bottle containing twelve ounces of the Bagshot water, of one degree of hardness, and neutral to test paper.

Results. — Metal at the end of a fortnight considerably dulled, the bottle near which it had rested being slightly coated with oxide.

Tested. — *No perceptible effect* on the application of the test, which was frequently and carefully repeated.

Remarks. — The effect produced by this water on the lead was very similar to that occasioned by distilled water, although less considerable.

From these experiments we deduce the following highly important conclusions: —

1st. That Thames water, by which the greater part of London and its suburbs is supplied, acts very decidedly on lead. From the similarity in chemical composition of Thames water with that of the New River, Lea, and Ravensbourne, there is good reason to believe that these would affect that metal to nearly an equal extent.

2nd. That the water supplied by the Hampstead Company, both pond and well, acts energetically on lead, much more so than Thames water.

3rd. That the water of the Artesian well in Trafalgar-square likewise acts strongly on lead, rather less so than the Hampstead well water, but still more energetically than Thames water. Buckingham Palace and one or two of our public buildings are supplied with this water.

4th. That the pure and soft water of the Bagshot springs exerts only a very slight action on lead, a small quantity of insoluble oxide, after contact with that metal for a fortnight, alone being formed. The results of experiment on this water offer conclusive refutation of the evidence to which certain gentlemen have, unfortunately, become committed.

SECTION IV.

PROPOSAL OF THE BOARD OF HEALTH FOR THE SUPPLY OF THE METROPOLIS WITH WATER.

When the various facts referred to in the course of this Report are called to mind, showing the many advantages attending the use of *soft water*, as well as the numerous and serious evils connected with the employment of *hard water*, few persons will be disposed to question the propriety of the condition which requires, that whatever water be selected for the future supply of the metropolis should be of the kind denominated soft, and, above all, should be free from organic contamination of every description. By these tests must all propositions for the water-supply of towns and cities be tried, those, where a choice exists, being unhesitatingly rejected, which are found wanting, either with respect to the quality of softness, or *more especially freedom from organic impurity, the most dangerous species of impurity to which water is liable.*

Two propositions have been made by the General Board of Health for the supply of the metropolis with water. As these, however, are rather modifications of each other than distinct proposals, the consideration of the one is intimately connected with that of the other.

The first proposition had for its object the collection of the "rainfall" of an extensive district known as the "Bagshot sands."

Of the extent and character of these sands, the following concise and very clear description is given by Mr. Robert Austen:—

"The Bagshot sands, as a continuous series of beds, extend from Esher to Strathfieldsaye, east and west, about thirty miles. Their width is variable; they occur north of Virginia Water, and their most southern point is on the summit of the high ground above Farnham. If we estimate them to have a mean breadth of ten miles, they will cover an area of 300 square miles.

"The composition of the beds of this series is remarkably uniform.

"*a*. The upper portion consists of pure siliceous sands. This division attains its greatest thickness about the north and east portion of the mass, as at Bagshot Heath, Chobham Ridges, Romping Downs, Finchhampstead Ridges, Hartfordbridge Flats. These sands are from 200 to 300 feet in thickness.

"*b*. Beneath these sands is a retentive stratum of marl and clay, varying from five to fifteen or twenty feet in thickness.

"*c*. The lowest portion consists of white and pale yellow sands, purely siliceous for the most part, the subordinate argillaceous strata being at the eastern portion of the map.

"Over the areas of the upper and lower sands much rain-water is absorbed as fast as it falls. That of the upper sands is thrown out, and collected over the surface of the retentive stratum, No. 2. At the junction of the two all the streams and streamlets take their rise, and this same retentive stratum, when denuded, supports the watercourses and ponds of the district."

In a second communication from the same gentleman, addressed to the Commissioners of the General Board of Health, the following additional observations on the district are made:—

"It will be seen that the water supply is proposed to be taken exclusively from the elevated ground north of Farnham, from the Chobham Ridges, from the Romping Downs, as well as from the high land extending from Bagshot Heath to the Fox-hills, near Chertsey, the whole of which districts belong to that division of the Bagshot sands which constitutes their upper portion, and whose composition was explained in the memorandum above alluded to.

"The peculiar advantages which this area presents consist, first, in the circumstance that great quantities of water can be collected at once from streams of considerable volume, and before they have been rendered impure by the influx of the sewage of inhabited districts; secondly, that the surface-drainage may be accelerated, whereby loss by evaporation will be diminished; and lastly, that it affords considerable facilities for its collection.

"The elevation of the whole of the district I have indicated is a most important physical feature, with reference to the supply of London."

Professor Ramsay, of the Geological Survey, gives a description of the district very similar to that of Mr. Austen.

The Bagshot sands, since they consist of nearly pure silex, are exceedingly well adapted for collecting the rainfall; for, being insoluble, they impart little or nothing of an impure nature to the water which percolates through them.

Having thus given a general idea of the character of the "gathering grounds," we will proceed to ascertain the quality of the water, and to determine how far it agrees with the conditions laid down as essential to every water destined for the supply of large populations.

In reference to its softness or freedom from saline impurity, we have the following satisfactory evidence:—

Dr. Robert Angus Smith, in reply to questions by the Board of Health, gives the following testimony:—

"Allowing the average of the Farnham water to be about two and a half degrees, it will represent the quality of the water derivable from the whole of the eastern part—that is, from twenty to thirty square miles of gathering ground, as far as I have seen, nearly *all waste*. In respect to quality, the Farnham water is equal to the mass of any Lancashire or Cheshire water derived fro gathering grounds which I have examined. In softness it is equal, in som places superior, to the Bala-Lake water, from the proposed collecting poi above Llangollen."

The evidence of Professor Way, of the Royal Agricultural Society, is to th following effect:—

"Have you analysed the specimens of water given to you by Mr. Paine, o Farnham?—I have examined them to a certain extent.

"Will you state the result of that examination?—The specimen which operated upon was obtained by Mr. Paine and myself from the commons, nea Farnham, being collected from a small well near its source, through which th water flows on its way to the town. I found it bright and sparkling, and quit different to what we are in the habit of recognising in rain-water, which i usually collected in a manner very unfavourable to its qualities for domestic o other purposes. The total quantity of salts of any kind in a gallon of thi water, proved to be 1·5 grains, which, so far as I am aware, is as small a proportion as is found in any considerable body of natural water from any sourc The proportion of lime I found to be ·168 grains in a gallon, which is equivalen to exactly three-tenths of a grain of carbonate of lime in the gallon, or three-tenths of a degree of hardness of Dr. Clark's test."

Other testimony of a like character has been given by Dr. Lyon Playfair, Mr Napier, and many others.

It is therefore evident that the Bagshot or Farnham water is possessed of a least one of the qualities necessary—viz., unusual softness.

We have next to inquire into the condition of the Bagshot water, as respe contamination by organic matter, and on this point we will quote the eviden of Dr. R. A. Smith, who was employed by the Board to make a particul examination of the district in question.

"Are you aware whether in any of the towns now supplied, or to be supplied, with soft water from gathering grounds, as at Bolton or Manchester, under-drainage has yet been thought of?—No, in none of them.

"Even if the surface water were taken, as for the northern towns, from th surface of the district, crudely as at present, and without any further improvement, would not the general supply from the entire district you have examin be superior to most river-waters, not to speak of the Thames?—Yes, certainly It would have the greatest superiority in respect to softness; it would have le mineral, and would be nearly pure from animal matter; and it would have l vegetable matter. The only matter in it is peat, and that is not visible to th eye. I except some portions of the district which might be separated or improved.

"What are the chief causes of the variations in the quality of water whi you find in this district?—Variations arising from peat chiefly.

"Is not the peat very thinly spread over the whole district?—It is not thic anywhere; but the variations in the quality of the water are caused by the st and inclination of the surface, which occasions the rain to wash the peat surfac alone before it is discharged into the brooks.

"We understand, then, that by the shallow drainage which you contempla you have in view the instance of the derivation of the water for the supply of th town of Farnham, by which the water falling on the surface of peat pass through the peat, and thence through the sand into the tile-drain, cleared of th peaty infusion?—Yes, that describes the process.

"What is the depth of the peat on the gathering grounds for Manchester?— Some of it about six feet deep; a great part of it about four feet deep.

"What was the depth of the peat on the gathering grounds for the new supp of water for Liverpool?—That which I saw was from two to three feet deep.

"Mr. Donaldson, the agricultural surveyor, reports to the Board, th surface peat on the Surrey wastes is so thin, much of it some six or eight thick, that it might be taken off at a cheap rate?—Yes; but from the insta which I observed, it would suffice to take off two or three inches of peat from th surface.

"You do not, then, think that the infusion of peat, even if the water we taken as it is, would be highly objectionable?—No, it is not thought so; pe itself is highly antiseptic; it is not considered favourable to the production of animalcules; it is not directly convertible into animal life like the organic matter in the Thames, and most river water. The only objections I know to it are the taste and the colour, which are disagreeable when the infusion is considerable."

It thus appears that the only description of organic matter present in any quantity is derived from the peat, which forms a thin layer over portions only of the district, and which there would be no difficulty whatever in removing altogether.

Now of all organic matter, that from peat is the least hurtful; it partakes of the nature of charcoal, and as contained in water, it consists of little else than colouring matter, removable by natural filtration through sand.

The Bagshot water, therefore, fulfils to a great extent the second condition laid down as necessary—viz., freedom from contamination by organic matter.

In the description of the upper stratum of the Bagshot sands, Professor Ramsay states that it appeared to be slightly coloured with oxide of iron.

The traces of iron observed in some of the samples of water examined, were derived, chiefly, no doubt, from this oxide, which, however, is present only in certain parts of the district.

At the termination of the examination of Dr. Smith by the Board, we notice the following questions, with the replies thereto:—

"Do you see your way of obtaining any supplies of equal purity for the metropolis?—I know of no other siliceous district near London, and I take it for granted that there is none producing soft water, or geologists would have pointed it out.

"Even if little or nothing were done either on the surface or with the mode of collection, we are to understand, then, that the supplies derivable from the greater portion of these Surrey sandy districts would be on an equality with the soft water supplies of the northern towns you know of, as at present collected and distributed to them?—Yes, certainly."

We find, too, Professor Way giving testimony equally strong in favour of the Bagshot water.

"In both a sanitary and an economical point of view you would, then, consider such water of proper quality for the supply of the metropolis or of any large town?—Undeniably; I have before stated my belief that rain-water collected in a pure atmosphere, and on surfaces uncontaminated with decaying animal or vegetable matter, or with soot, &c., is the most perfect form of water. It is, in fact, the nearest approach to *distilled* water; but having the advantage over artificially distilled water of being well aërated, and therefore agreeable to drink. I consider the water of Farnham, of which we are speaking, to be *rain-water*, collected in the most unexceptionable manner that is practicable on the large scale."

As the result, then, of what has now been stated and ascertained, in reference to the water procured from the Bagshot sands, we deduce the general conclusion, that that water is in every respect admirably adapted for the supply of the metropolis: it is soft, and therefore possesses all the advantages of soft water; it contains but little carbonic acid, alkaline, or earthy carbonates, and therefore its action on lead would be infinitely less than that of every hard water now in use; it is almost free from organic matter, and as the little it does contain is of a harmless description, capable of separation by filtration, not the slightest cause of apprehension would exist of the production of disease from its use.

But another very important circumstance relating to the Bagshot water remains to be stated—viz., that for some years past the town of Farnham has been supplied by this very water; its properties have thus been put to the very best test possible—viz., that of practice, with the most satisfactory results.

Mr. Paine, of Farnham, gives the following information in reply to questions by the Board:—

"For how many houses does this drainage of two acres give you a supply?—For 116 houses, night and day; and they do not use half the supply that is obtained; and the addition of a drain from one point might, for an outlay of 10*l.*, give double the quantity we now have, if necessary.

"Then the supply to the Bishop's Palace is constant?—Yes; but it has no connection with the town supply. It is derived from another "tapping" of the hill.

"Is the water conveyed there through lead pipes?—Yes.

"Your supply also is through many leaden pipes in the town?—The mains are of iron, but the pipes which convey the water into the houses are of lead.

"Have you heard of any casualties from the effect of the soft water upon these leaden pipes?—I am not aware of any having happened; the supply is constant, and consequently there is no need of cisterns.

"How long has the supply been in existence at the Bishop's palace?—I should say 200 years, or perhaps more.

"How long has your own supply been in operation?—Since 1837.

"You are, I believe, a native of Farnham, and acquainted as an agriculturist with all the country around?—Yes.

"From how many miles of surface, as far as you have observed, can a similar supply to that of Farnham be obtained?—I should say from a district of fifteen miles in length, and varying from three to six miles in breadth, lying between Farnham and Wokingham.

"Then you see nothing to affect the conclusion that by like care being extended over the whole district, some fifteen miles long, to from three to six or seven miles wide (thus making some eighty square miles of gathering ground), water of a similar quality to that delivered in Farnham would be obtainable?—I think so; but I should not drain the whole surface of the district, but only those spots where water is found to ooze out at the sides of elevations."

From this evidence alone it is plain that the action of the Farnham water on lead is not considerable, and from it also some idea of the *quantity* of water available may be formed.

It has been stated that two propositions have been entertained by the Board of Health for the supply of the metropolis with water from the Bagshot district: the second and more recent proposition contemplates, not the use of the whole rain-fall, but of *that only which re-issues from the earth in the form of springs*, and this we will next consider.

A careful and extended examination of the proposed "gathering grounds" has brought to light the important fact, that in and around the space which these describe, a considerable number of springs exist, the united yield of which is alleged to be fully sufficient to supply the demands of the entire metropolis.

We now quote the following remarks from the report of Mr. Napier, in reference to the Bagshot springs:—

"Guided by what I had seen at Farnham-hill, I turned my attention to look for springs, and, after much and close examination, came to the conclusion that the origin of many little silver threads of water, silently stealing down the hill-sides under the grass, arose also from such sources. A diligent search showed me that the quantity of water to be derived in this manner within the original area of the gathering grounds is so great, that if the neighbouring ranges of mountains and hills on the south side—namely, Hindhead, Blackdown, Hascombe-hills, Leith-hill, &c.—presented the same feature, I might probably hope to collect a stream nine feet wide and three feet deep, of the desired softness and purity.

"I am now happy to inform the Board, that a month's researches into every hill and glen, every copse and crevice, has produced this result. Having tested the waters as they issue from their sources, I can announce that I have gauged a sufficient number of springs and rivulets to enable me to form an opinion both as to quantity and quality; the water being of its primitive purity; perfect as to aëration; brilliant in colour; soft almost as distilled water; of a grateful temperature, about 50°; and almost free from all mineral, animal, and vegetable impregnation."

The stream referred to by Mr. Napier, nine feet wide and three feet deep, represents the quantity now brought into London by the different water-companies, flowing at the rate of two miles an hour, a supply double the actual cosumption.

The advantages of the supply from springs over that from the rainfall are, first, greater certainty, the supply being less immediately dependent upon the rainfall; second, superior quality, the water being softer, under 1° of hardness;

third, entire freedom from animal or vegetable matter, peat, or iron; fourth, greater economy, the outlay necessary for pipage and reservoirs for storage and filtration being much reduced.

The yield of the springs, according to Mr. Napier's gaugings and calculations, is given at 40,000,000 gallons of and under 1°, and 10,000,000 of and under 2° of hardness, a quantity sufficient for the supply, at the estimate of seventy-five gallons per house, of 523,126 houses, nearly double the present number in the metropolis.

The gaugings of a second engineer (Mr. Rammell) tend to show that Mr. Napier's calculations are much under rather than over the actual yield. Mr. Rammell estimates the supply to amount to upwards of 51,000,000 gallons.

Having now considered the *quality* and *quantity* of the Bagshot water, and having shown that, as respects the former, there is nothing further to be desired, and that there is every reason to believe that the latter is amply sufficient for the wants of the metropolis, we will, in the next place proceed to describe the measures proposed for the collection, conveyance, storage, and distribution of the water.

First, then, it is intended that the pipes, which are to be of earthenware, should be laid up to *the very sources of the springs*, and so arranged as to receive only the least flow; that they should be placed four or five feet deep in the earth, whereby the coolness of the water will be preserved; that they should follow the natural slopes of the country, and converging, that they should be brought down to the pass in the range of the Hog's Back at Guildford.

Collected at this point, it is arranged that the pipes discharge themselves into a double culvert of brick, which is of course *covered*: the line of direction of this culvert, as proposed by the Board, "is an inclination from the contour at Guildford to that at Wimbledon Common, thus saving expensive foundations by keeping under the surface, the deviation from the straight line not being considerable."

At Wimbledon Common it is proposed that there should be a reservoir, also *covered*, "the depth to be 20 feet, the width 100 feet, spanned in three flat hollow brick arches, and the capacity made good in length on the line of direction to London; the sides and bottom to be puddled and lined with tiles laid in cement. The entering water *should be introduced in several places* at the bottom, and not opposite the channels of delivery; thus compelling a thorough mixture, and avoiding all stagnation."

The position of Wimbledon is sufficiently elevated to afford high pressure service to more than one-half of London.

We believe we are correct in stating that we were the first to bring prominently under the notice of the Board of Health the injurious effects, especially those relating to the development of vegetable and animal productions, resulting from the exposure of water to air and light, as well as from a state of rest or stagnation, and we are glad to perceive that the reasons urged have been appreciated, and that it is proposed to carry out the principles laid down, that water, as far as practicable, should be kept in motion, and excluded from the light, in a manner so satisfactory and efficient.

Mr. Napier adduces the following testimony, showing the effects of stagnation on water:—

"A fact which strongly corroborates the evil influence of reservoirs in allowing the water to stagnate, has been exemplified at Dublin, the north side of which city is partly supplied by the Portobello reservoir, about 100 yards long, 70 yards wide, and of a considerable depth; the reservoir is supplied from a canal close by, through which a current is constantly flowing. A few years ago, this reservoir was exceedingly dirty, and while being cleaned, the supply was drafted direct from the canal, when a considerable improvement was remarked in the quality of the water. The reservoir being cleaned, the water was again turned in, and although passed through a new filter, there was an immediate change for the worse, being in fact little better than before the reservoir was cleaned, thus corroborating the assertion of Dr. Hassall, that water not kept thoroughly in mixture and motion must deteriorate."

The existing apparatus of street and home distribution is to be retained for the present, earthernware mains ultimately being substituted for the iron ones now in use.

Lastly, the proposal of the Board of Health contemplates the substitution of the *continuous* for the *intermittent* system.

The *disadvantages of the intermittent system* are, that it necessitates the u of cisterns, whereby the quality of the water is seriously affected; that it leads to great waste, the surplus water frequently overflowing the butt, or cistern, rendering the house, yard, soil, &c., damp, and so giving rise to disease; and, lastly, that it is attended with much expense.

Few persons have formed any correct idea of the expense and waste resulting from the intermittent system, and the consequent use of cisterns: we have been shown plumbers' bills, in which the annual charge for cleansing the cisterns, and repairs of the ball and tap, have amounted sometimes to more than the entire water-rate, an expense which not unfrequently leads some not over-scrupulous persons to dispense as far as they are able with these costly pieces of machinery. One individual informed me that so constantly was he annoyed by the ball-tap getting out of order, and with the expenses for its repairs, th he removed it entirely, first satisfying himself that the orifice of the waste-pipe was fully as large as that of the service-pipe. The tap in this case has no been removed just ten years, and although the former occupant of the house ha been succeeded by a new tenant, its use is still dispensed with. This, we a convinced, is no solitary instance, but that there are hundreds, if not thousands of similar cases in this metropolis.

A cistern, to be in a condition approaching even cleanliness, should be washed out at least once a fortnight; the plumber's charge for this varies, we believe from 2*s.* 6*d.* to 4*s.* 6*d.*, and no labourer would consider himself sufficiently pa with less than 1*s.*: the expenses connected with the cleansing of the cistern, independent of repairs, is no light tax upon the housekeeper.

For further remarks exposing fully the evils resulting from the use of cisterns the reader is referred to the work on water, by the author, more than once me tioned in the preceding pages. Other evils attending the use of cisterns in a dition to those already mentioned, are, the difficulty of getting at them to c them; their exposure to light and air, whereby the quality of the water is d teriorated; and the objectionable position in which they are often placed, fr quently immediately over the water-closet.

The *advantages of the continuous system* are, that it entails the abolition cisterns, with their concomitant evils and expenses: the water as delivered purer, cooler, and not subject to waste, and so saturate the soil; and tho last, not least, the mains being fully charged, will at all times yield an abund supply with great pressure, for the cleansing of streets and houses, for wat roads, the extinction of fires, &c., whereby the saving of many thousand pounds and much valuable property would be annually effected.

The expense of the execution of the works proposed by the Board of He for the supply of the whole metropolis, is not expected to exceed 700,000*l.*— sum less by some thousands than has been expended by the New River Comp alone.

The amount of the water-rate which would have to be levied is estimated small tenements at 1*d.*, and, on the larger, at 2*d.* per week.

We cannot more appropriately conclude our brief sketch of the propos the General Board of Health for the supply of the metropolis with water, th in the words of its own Report.

"Various detailed estimates have been made, at our instance, of the expe distributory apparatus, including service-pipes for carrying constant supp water into tenements of the poorest classes, as part of works for sanitary provement requisite for the worst conditioned places; estimates have also made of the expense of distributory apparatus for the supply of houses of classes above the poorest. The result is, the confident assurance of all engineering inspectors, supported by other concurrent practical testimon an entirely new supply of the softest water may be brought to the met pure, and well aërated, and may be delivered into every house in the met in a constant supply, unlimited in quantity, for drinking, for culinary an domestic purposes, for baths and for washing, at an average original rent- inclusive of the expense of the tenant's supply-pipe and tap, of 2*d.* per w ment.

Vith these results, which, with adequate powers, could unquestionabl obtained, the metropolis would be placed in a condition equal in respect to the quality of its supplies of water, and superior in respect to their distribution, to any metropolis or city in the ancient or the modern world."

With a few brief observations of a general nature we will bring our article on water to a conclusion.

We would now observe, that in the remarks which we have felt it our duty to make, in reference to the proposal of the Board of Health for the supply of the metropolis with water, we have been animated solely with an earnest desire to ascertain the truth, and to proclaim it.

The proposition of the General Board of Health appears to us to be so immeasurably superior to every other that has yet been suggested, that, in the interest and for the welfare of our fellow citizens, we have done our best to elucidate its chief features, and now give it our strenuous support.

The Board of Health has set to work in the right way, and in the right spirit. It first laboured diligently to get at the facts, and after having studied the subject, and mastered it, the Board now comes forward, and submits its proposition to the public in all its details—a proposition based on well-ascertained facts.

How different has been the course pursued by the Board, and that of the directors of the water-companies, the great majority of whom, although holding the responsible position of supplying the public with so prime a necessary as water, really knew nothing about water, or of the qualities necessary to it as a pure and wholesome beverage, until the Board of Health supplied them with correct information on the subject. And now that they are a little more enlightened, what has been their conduct?—how have they been occupied? In the endeavour to get together a little trashy evidence intended to damage the proposition of the Board. This evidence, regarded in a scientific point of view, is so worthless, that we will not condescend to notice it; it is abundantly refuted by the ascertained facts of the case.

We recommend the directors to follow a more judicious course; not to spend their money in useless litigation, but to acquaint themselves with the facts as stated, and if they find them to be correct, as honourable and conscientious men, not to stand in the way of a great public benefit, but to accept with the best grace they can the fair and liberal compensation which will doubtless be awarded them. Opposition, we affirm, will in the end, although this may be deferred for a time, be completely thrown away.

We are sorry, however, to find that the very meagre conflicting testimony which the directors, by means of their cash, have been able to get together, has induced the Ministry to appoint three "commissioners" to report to it on the water supply of the metropolis, these newly appointed "commissioners" being altogether independent of the Board of Health.

We object to this course on more grounds than one. In the first place, the whole matter is clearly proved and settled; no additional testimony is required, and we very much doubt whether further information on the subject will be forthcoming. In the second, we deem this nomination of independent commissioners most unbecoming to the Board itself; it has the effect of casting an unmerited doubt as to the character and sufficiency of the evidence obtained by it; and if the government show its want of confidence, by what reason is it expected that the public is to retain its faith?

The report of these commissioners will, we can scarcely doubt, confirm the conclusions of the Board; indeed, there is but little room for any other result, and the government, we trust, will find its hands strengthened by the "commissioners." The conduct of the Ministry in this matter may therefore have been such as to help them over a difficulty; the stratagem may have been very politic; but we prefer straightforward dealing to strategy, and therefore we condemn this very unhandsome treatment.

If it was considered desirable that additional evidence on any point of the inquiry should be obtained, the Board itself should have been instructed and empowered to procure this; the only particular in which the evidence is at all weak is in reference to the comparative action of hard and soft water on lead—a point completely set at rest by the experiments adduced in this Report.

The three commissioners are, Professors Graham, Miller, and Hofmann; they were selected because they had *not become* identified in any way with the Board *of Health by giving evidence,* and therefore it was considered their testimony would be impartial—a very bad compliment to those gentlemen who have supplied the Board with information, much of it of a valuable character.

We have no desire to speak disparagingly of the three gentlemen named, who are men of high chemical attainments and of good reputation; our concern is with the circumstances relating to their appointment, and with the facts of the case. We would now observe that these gentlemen, although very good chemists, are not known (with the exception of Professor Hofmann, of whose testimony the Board has already had the advantage) to have devoted any special attention to the subject of water, upon which they are now called suddenly to give a weighty opinion; while, on the contrary, the evidence adduced by the Board has been furnished by men of not less standing and reputation than themselves, and who have devoted years to the study of the subject, and who were qualified to give, not merely chemical opinions, but to enter into the medical, physiological, and other bearings of the inquiry.

It now only remains that we give expression to the great satisfaction which we have derived from the fact, that a very large portion of the scientific evidence procured by the Board has been supplied by members of the medical profession—a circumstance highly creditable to their knowledge and intelligence. When will governments learn to treat our ill-requited but meritorious profession with justice and liberality?

Since the date at which the above Report was published the entire subject of the water supply of the metropolis has been submitted to the consideration of a Commtttee of the House of Commons, of which Sir James Graham was chairman. The results of all the evidence given before this committee, and of its deliberations, have ended as most other questions, in which on the one hand the rights and interests of the public are opposed by interested and powerful monopolists on the other, do end in this country, in a compromise, probably but little satisfactory to the water companies themselves, and certainly still less so to the public at large. The metropolis and its suburbs are still to be supplied with water from the Thames, although this is not to be taken below Kingston; the water is to undergo a process of filtration; and the reservoirs in which it is to be stored are, we believe, to be covered; these provisions to come into operation in 1856. These changes, as far as they go, are no doubt in the right direction, but the evil is that they do not go half far enough. The public will still be supplied with *hard water contaminated to a considerable extent with organic and other impurities*; and, further, the supply is to be distributed on the intermittent system, which entails the use of cisterns, to which there exists so many strong objections. At the various sittings of the committee above referred to the interests of each of the metropolitan water companies were represented by one or more Old Bailey barristers, some of whom thought that they could not properly or sufficiently discharge their duty to their clients, except by bullying and insulting every adverse witness who had the courage to appear on behalf of the public. We ourselves had the honour on this occasion to advocate the interests of the public in this important sanitary question, and of course did not fail to get grossly abused by more than one of the "big wigs," but as the cause was a good one we did not very much care. Each sitting of this committee, it is alleged, cost, chiefly in fees to the lawyers, upwards of 1000*l.*; and, as there were many sittings, so of course many thousands were thus expended, which will have to be refunded through the instrumentality of the water-rates. For the improvments above referred to, imperfect and incomplete as they are, we may conscientiously affirm that the public are largely indebted to ourselves, for we have not ceased, for years past, on every favourable occasion and by every means in our power, to agitate this great social and sanitary question.

CHICORY, ITS PROPERTIES AND ADULTERATIONS.

Chicory, succory, or wild endive, belongs to the same natural family of plants as the dandelion, a very characteristic and familiar cognomen of which we refrain from mentioning. Like the dandelion, chicory is indigenous, and may be seen growing in various parts of the country, by the road or hedge side; it may be recognised by the compound character of its flowers, and their bright and beautiful blue colour. It blossoms in the months of August and September, and any person desiring to get a sight of this very notorious vegetable, may gratify his or her curiosity by a walk along the banks of the Thames, from Kew for about a mile or so in the direction of Richmond.

"This plant," says M'Culloch, "is found growing wild on calcarious soils of England, and in most countries of Europe. In its natural state the stem rises from one to three feet high, but when cultivated it shoots to the height of five or six feet. The root runs deep into the ground, and is white, and fleshy, and yields a milky juice. It is cultivated to some extent in this country as an herbage plant, its excellence in this respect having been strongly insisted upon by the late Arthur Young.

"But in Germany, and in some parts of the Netherlands and France, it is extensively cultivated for the sake of its root, which is used as a substitute for coffee.

"When prepared on a large scale, the roots are partially dried, and sold to the manufacturers of the article, who wash them, cut them in pieces, kiln-dry them, and grind them between fluted rollers into a powder.

"The powder has a striking resemblance to dark ground coffee, and a strong odour of liqourice. It has been extensively used in Prussia, Brunswick, and other parts of Germany, for several years, but as it wants the essentail oil, and the rich aromatic flavour of coffee, it has little in common with the latter, except its colour, and has nothing to recommend it except its cheapness."

Notwithstanding that chicory "has nothing to recommend it except its cheapness," and that it is used exclusively to adulterate coffee, it has of late years been raised in great quantity in this country, owing to the very improper encouragement given by Government.

Large crops of chicory are grown in Yorkshire, in the neighbourhood, it is stated, of property belonging to the Chancellor of the Exchequer, and it was this circumstance which led to the assertion recently made, that Sir Charles Wood was himself an extensive grower of the plant.

This statement, we are happy to say, has just been distinctly contradicted by the Chancellor, who, however, in making known the denial, refrained from any allusion to the circumstance which explains the origin of the report. We are not surprised that the charge should have been made, for it is only natural that when an individual pertinaciously follows a course opposed to reason and correct principles, as Sir Charles Wood has done in the case of chicory, that an endeavour should be made to account for conduct so singular, and that it should be imagined that some strong personal interest existed, whereby the course of proceeding adopted might be explained.

The following Analyses of Chicory in its different states, with Report on the properties of that root, particularly as contrasted with coffee, are by Dr. Letheby and ourselves:—

"No one who is acquainted with the respective properties of chicory and coffee can for a moment entertain the opinion that the former can be effectively substituted for the latter; but inasmuch as great misapprehension prevails with the public respecting the supposed virtues of chicory, we have instituted the following analyses for the purpose of determining its nature and composition.

"In the first place, it will be noticed that coffee and chicory differ very essentially from each other in their botanical nature; for the one is the fruit or seed of a tree, while the other is the succulent root of a herbaceous plant. Now it is a well-ascertained fact, that of all parts of vegetables, the fruit and seeds usually possess the most active properties—this is no doubt due to the circumstance of their being freely exposed to the influence of light and air—agencies which promote chemical changes in the plant, and so effect the elaboration of those complex organic substances on which the activity of vegetables depends. On the other hand, it must be manifest, that, as the roots are removed from the influence of these powerful agencies, they cannot be so richly endowed with active properties; and, indeed, there are but few roots, which contain either alkaloids or volatile oils—the two classes of constituents which give to coffee its peculiar virtues. The distinction, therefore, between the properties of the seeds and roots of plants is very important, and it is especially so in the case before us.

"In the preparation of chicory the older roots are selected: they ar cleansed in a very imperfect manner by washing, then cut into slices, and in a kiln: in this state they are furnished to the chicory-roaster, who su them to a rough kind of roasting process, somewhat similar to that employ the torrefaction of coffee; after which they are powdered, the powder being frequently extensively adulterated.

"The root has been examined by us in three conditions, namely:—

"1st. In its recent, or raw state.

"2nd. In the kiln-dried condition.

"3rd. In the roasted and powdered form, as it is used for the adulterati coffee.

"The *raw root* furnishes a milky juice, which owes its opacity to the pre of an inert vegetable substance named Inuline. The juice is very bitter, when filtered and heated, it shows, by its turbidity, that it contains a quantity of albumen.

"When macerated in cold water, it yields about 13 per cent. of solid m or extractive, which gives to the solution a very bitter taste; alcohol als tracts this bitter constituent, and on evaporation it furnishes a gummy pro which is very similar in its properties to the bitter material of the dand root. Acetate of lead produces a copious precipitate in the liquid fron deposition of gum, vegetable acid, and colouring matter. By means of Feh test, it was found that the raw root contained 1·1 per cent. of grape-sug glucose.

"The *kiln-dried root* possesses all the characters of the preceding, but higher degree, for water extracts about 50 per cent. of solid matter; an solution furnished to Fehling's test as much as 10·5 per cent. of sugar.

"Neither of these specimens exhibited the least trace of starch, but by b in water, filtering, and cooling, they yielded a small quantity of a white po which had all the characters of Inuline.

"The absence of starch in the state in which the root is ordinarily used i conclusively shown by means of the microscope, and we find that the tissue tains abundance of cellulose, which, by the action of strong sulphuric acid, a product that renders iodine blue.

"The *roasted Chicory root* yields from 45 to 65 per cent. of soluble extra Its solution in water is acid, and it does not possess the peculiar bitter ta the raw root; but the taste of the liquid is more like that of burnt sugar. copper test shows the presence of from 10 to 13 per cent. of sugar.

"The following analyses represent the per-centage composition of th in its different conditions:—

	Raw Root.	Kiln-dried.
Hygroscopic moisture - -	77·0	15·0
Gummy matter (like pectine) - -	7·5	20·8
Glucose, or grape sugar - -	1·1	10·5
Bitter extractive - - -	4·0	19·3
Fatty matter - - -	0·6	1·9
Cellulose, inuline, and woody matter -	9·0	29·5
Ash - - - -	0·8	3·0
	100·0	100·0

"The composition of the roasted root was as follows:—

	1st Specimen.	2nd Specim
Hygroscopic moisture - -	14·5	12·8
Gummy matter - - -	9·5	14·9
Glucose - - - -	12·2	10·4
Matter like burnt sugar - -	29·1	24·4
Fatty matter - - -	2·0	2·2
Brown or burnt woody matter - -	28·4	28·5
Ash - - - -	4·3	6·8
	100·0	100·0

he ash of these had the following composition : —

	1st Specimen.	2nd Specimen.
Chloride of potassium	0·22	0·45
Sulphate of potash	0·97	0·98
Phosphate of potash	1·41	1·37
Ditto of magnesia	0·30	0·53
Ditto of lime	0·40	0·81
Carbonate of lime	0·10	0·26
Alumina and oxide of iron	0·20	0·20
Sand	0·70	2·20
	4·30	6·80

y an examination of the foregoing analyses it will be seen that the root does ntain anything which can possibly be regarded as a substitute for coffee. be also manifest that in the process of roasting, the bitter principle is en- destroyed, and that by the torrefaction of the saccharine and other consti- a quantity of caramel is produced, which has no virtue beyond that of sugar. It is likewise evident that the kiln-dried root has undergone a of fermentation, whereby the amount of sugar has become greatly sed.

Ve will now compare the preceding results of our examination of chicory ith the analyses that have been made of coffee berries.

a memoir published by M. Payen in the 'Journal de Pharmacie,' of Paris, year 1846, it is shown that the unroasted coffee berry has the following sition : —

Hygroscopic moisture	12·000
Sugar, gum, and acid	15·500
Nitrogenous matter (Legumine, Casein, &c.)	13·000
Free caffeine	0·800
Chlorogenate of caffeine, &c.	3·5 to 5·000
Fatty substances	10·0 to 13·000
Concrete essential oil	0·001
Aromatic fluid essential oil	0·002
Cellulose and woody fibre	34·000
Mineral substances in ash	6·697
	100·000

he composition of the ash is —

Alkaline phosphates	2·64
Sulphate of potash	0·03
Chloride of sodium	0·04
Carbonate of lime	0·26
Carbonate of magnesia	0·78
Sulphate of lime	0·10
Phosphate of lime	2·82
Silica	0·02
	6·69

he composition of the coffee berry, after it has been roasted, will depend degree of heat to which it has been subjected. If the temperature have een raised above 500° Fahr., the berries will not have lost any of their principles, and but little of their aromatic volatile oil; but they will given off about 18 per cent. of water, and have acquired a small proportion pyreumatic matter.

the act of roasting, the organic salt of caffeine is partially decomposed: omes red, and a portion of the active principle caffeine is set free. The ose, and those substances which are allied to it, become, to some extent, ised, and yield coloured and empyreumatic products. The fatty oils become diffused throughout the mass thus rendered porous, and carry with them the slightly modified essential oils. The fixed and volatile oils readily yield to the action of water, especially when hot, as in the making of coffee.

"If the roasting be discontinued at this period, the berries acquire a light chestnut colour, and become so friable that they are easily reduced to powder; but if the roasting be continued further, carbonisation of the nitrogenised ingredients occurs, and an empyreumatic oil is generated, which takes the place of the volatile aromatic principles: the caffeine is likewise dissipated and even destroyed to a great extent. By this treatment the coffee loses a considerable amount of its soluble active principles; and, as may be supposed, the loss is still greater with further torrefaction. The best temperature for the operation is about 482° Fahr., which does not dissipate the volatile aromatic oil, or decompose the caffeine; at this temperature the berry acquires a light red-brown or chesnut-colour.

"Well-roasted coffee yields about 37 per cent. of extractive to boiling water, of which about one-fourth consists of nitrogenised matters, which Payen regards as being highly nutritious; in addition to which, he considers the aromatic essential oils, which are also contained in the infusion, as valuable dietetical agents, and as having the power of acting as agreeable stimulants to the digestive organs. Many chemists have remarked the curious relations which exist between the composition of the caffeine of coffee and some of the products of the human system. This relation, coupled with the fact, that coffee and its allies—tea and cocoa (both of which contain a similar active principle)—are instinctively used by all the nations of the earth, indicate that it serves some important purpose in the animal economy. No one has commented on this fact with greater force than Liebig, who, in alluding to it, says, 'it is impossible to admit the assertion that the use of coffee and tea is a matter of mere habit.' We think it, on the contrary, highly probable, not to say certain, that the instinct of man—feeling certain blanks, certain wants of the intensified life of our times, which cannot be satisfied or filled up by mere quantity—has discovered in these products of vegetable life, the true means of giving to his food the desired and necessary quality.' Now it happens, that chicory does not contain a particle of any constituent or principle which can be regarded as having the remotest analogy with the vegetable principles of coffee; how, therefore, can it be said to act as a substitute for it? Payen has compared the infusion of the two substances, and he says, 'that when they are of an equal colour and density, the solution of chicory contains only half as much of nitrogenised substance as the infusion of coffee. This is a real cause of inferiority, but it is unworthy of notice when compared with the enormous difference that separates this liquid without either a pleasant smell or taste, from an infusion, whose stimulating qualities and exquisite perfume are so remarkable.

"But, setting aside the results of actual experience as to the effects of chicory and coffee on the animal frame, and looking only to the positive results of the present analyses, we are in a position to arrive at certain definite conclusions with regard to the comparative properties and activity of chicory and coffee.

"Chicory belongs to the same natural family of plants as the dandelion, and resembles it very closely in its properties; for the extract obtained from both is bitter, and according to the best authorities, possesses diuretic and aperient qualities. Five ounces or 2187 grains of recent chicory-root, yielded 298 grains of extract, dried at a temperature of about 200° Fahr. This extract was of a light fawn colour, of a bitter taste, and of a pasty consistence: after having been kept for some days, it lost a considerable part of its bitterness. Forty, and even eighty grains, taken at one dose, failed in our case to produce any very marked or obvious symptoms.

"The properties of *kiln-dried* chicory differ but little from those of the recent root; the chief difference consisting in the loss of a very large quantity of which is expelled during the process of drying, in a diminution of bitter well as an augmentation in the amount of sugar.

"The *roasted root* contains less gum, more sugar, a good deal of arising from the partial charring of its tissues, and the bitterness has completely disappeared, that which remains being principally due to the sugar. The absence of bitterness would lead to the inference, that the properties of chicory are nearly, if not entirely, destroyed by the process

ɔut opposed to this, is the fact, proved by observation and experience,
y, in some cases, produces diarrhœa.

ıg to the results of the analyses of coffee, we perceive that it contains
ɔ principles which are possessed of undoubted virtue and activity.
essential oils, and the caffeine, act as powerful stimulants on the
stem; and it is worthy of notice that the stimulation is not followed
siderable amount of subsequent depression. Add to this, that, while
n made from the one is light, transparent, and aromatic — that from
thick, viscid, heavy, and almost inodorous.

uld say then, that while chicory exhibits no analogy whatever in its
ı with coffee, neither does it possess any properties in itself which
luable; and it is questionable whether the qualities which it does
ıot positively hurtful."

ve Report was written some time subsequently to the publication of
ıg brief remarks on the properties of chicory.

es Wood having stated, whether on his own authority or that of some
n does not very clearly appear, that chicory is both "wholesome"
tive," we propose to ascertain how far these statements are well

s possessed of active medicinal properties, in consequence of which
been included in the "materia medica."

ɔperties resemble closely those of the allied plant, the dandelion, in
which we find, in the work of Dr. Pereira, the following observa-

ious effects are those of a stomachic and tonic. In large doses it
ld aperient. Its diuretic operation is less obvious and constant. In
ɔnic diseases, its continued use is attended with alterative and resol-
; but where the digestive organs are weak, and readily disordered,
s very apt to occasion dyspepsia, flatulency, pain, and diarrhœa."

ıarks of course apply to the recent root, and it therefore now becomes
ıat we ascertain what are the effects produced on the human frame
when roasted. In order to determine this point, we have instituted
eriments or trials, the details of which we will now make known.

rsons partook of a chicory breakfast. The infusion was dark-
ıick, destitute of the agreeable and refreshing aroma so characteristic
ıd was of a bitter taste.

ividual experienced, for some time after drinking the infusion, a
heaviness, drowsiness, a feeling of weight at the stomach, and great
n to exertion; in two, headache set in; and in the third, the bowels
d.

d and third trials of the chicory breakfast, the same feelings of
weight at the stomach, and want of energy, were experienced, but
or diarrhœa.

ther trials were subsequently made, with nearly similar results.

ry, it will be said, is seldom taken alone in this country, and when
coffee these effects are not produced.

ons partook, for a considerable period, twice a day, of an article
d coffee, costing one shilling and sixpence a pound, and largely adul-
chicory: during nearly the whole of this time they both suffered
from diarrhœa.

result of these trials, therefore, we are warranted in concluding that
e doubt is attached to the assertion of the "wholesome" properties
oot as an article of diet.

nutritive" properties of chicory we shall say but little, feeling as-
he reader will scarcely be disposed to question the accuracy of the
hat a mouthful of good wheaten bread contains more nourishment
of infusion of chicory.

icory root is entirely destitute of the essential oil of coffee, as well as
," the active principle upon which most of the virtues of that invalu-
epend; and these deficiencies explain in a great measure the feeling
and want of energy experienced after drinking infusion of chicory.

e clearly borne in mind, however, that the mixing or adulteration of coffee with chicory is not objected to by us on account of the medi perties of chicory merely, but because we hold this practice to be pro considerations of money, justice, and public morality.

STRUCTURE OF CHICORY ROOT.

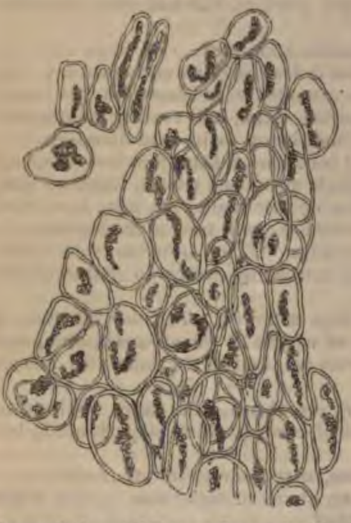
In the raw chicory root three parts or structures may be distingui facility, cells, dotted vessels, and vessels of the latex.

When the adulterating merchant or grocer, in the secrecy of his o house, first reduced chicory root, parsnips, corn, beans, &c., to ch shapeless masses, the idea probably never entered his mind that enou distinctive structural characters of each of these substances still rem destroyed, to enable the man of science to drag to light his guilty dee trace the presence of these substances in every parcel of adulterated c out from his premises.

In the roasted and charred chicory root the same structures may b as are distinguishable in the raw or unroasted root.

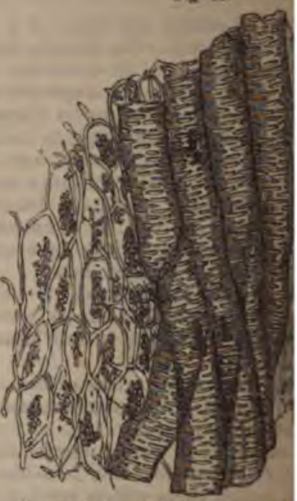
The chief part of the root is made up of little utricles or *cells*. generally of a rounded form, but sometimes they are narrow and The former occur where the pressure is least and the root soft; the la neighbourhood of the vessels.

Fig. 35.



Fragment of *roasted* CHICORY ROOT, taken from a sample of adulterated coffee, showing the *cells* of which it is principally constituted. Drawn with the Camera Lucida, and magnified 140 diameters.

Fig. 36.



Fragment of *roasted* CHICORY ROOT, sample of adulterated coffee, show or *interrupted spiral vessels*, w bundles through the central part Drawn with the Camera Lucida, 140 diameters.

The *dotted vessels* are particularly abundant in the central and hard the root, which they traverse in bundles: they are cylindrical unbranc tapering to a point at either extremity, and elegantly marked on t with short fibres, describing an interrupted spiral course.

In studying the structure of chicory root, we have clearly made out of the dotted vessels in narrow elongated cells tapering to a sharp poin end, at first smooth, but subsequently exhibiting faint oblique markin

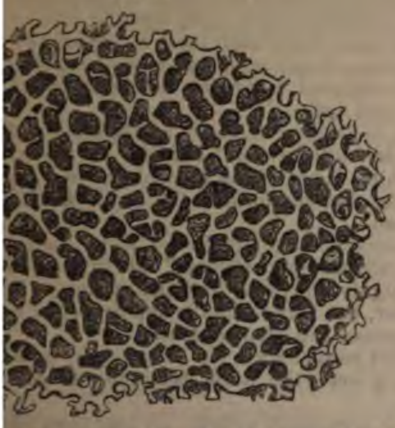
The vessels of the latex, *vasa lacticescia*, are present in most plan a milky juice or sap; they form branched and frequently anastomosin less diameter than the dotted vessels, and with smooth membranous p

These vessels afford a useful means of distinguishing chicory from s roots employed in the adulteration of coffee.

the Coffee Berry.—In our report on coffee, we entered minutely ure of the raw and roasted coffee berry; on the present occasion, hall refer to it only very shortly.

llor of the Exchequer, in May of the past year (1850), stated to the House of Commons, that "having desired the Board of Inland Revenue to state whether there was any ready and available proof of the mixture of chicory with coffee, he had received a reply to the effect, that four experienced persons having been employed in making experiments, the result of the inquiry was, that neither by chemical tests, nor in any other way, could they ascertain with any degree of certainty, whether the mixture contained chicory or not."

Fig. 37.



of Coffee Berry. Drawn with the Camera Lucida, and magnified 140 diameters.

It does certainly appear to us as very re- at four experienced persons" should, after special investigation, ely reported that "neither by chemical tests, *nor in any other* hey ascertain whether the mixture contained chicory or not, al- same time, the means of discrimination were so obvious and

erry is in every respect unlike chicory in its structure, and con- angular and coherent cells.

Adulterations of Chicory.

ory adulterated? A substance used to adulterate another article, ed? Impossible! we fancy we hear the inquirer exclaim. Im- thing appears, it is nevertheless true.

remembered that all the vegetable substances employed in the coffee require to be charred or roasted, and that to effect this a tus is required, such as but few retail grocers possess, it at once st probable that these substances are prepared for them by other

sion acquires increased force when it becomes known that the ocers buy their chicory, not in nibs, but *in powder*, and that this them by certain wholesale chicory houses, which charge for it, in price than for the nibs, or unground root itself, or than genuine can be fairly sold at.

ces which are either substituted for chicory, or mixed with it, are ; several of these we have ourselves detected, while others have d from time to time by different parties.

with Carrot.—The carrot resembles very closely chicory root ; the cells and dotted vessels it is impossible to distinguish from y, the chief difference is in the absence from the carrot of the atex.

ce, although sufficient on a prolonged examination to enable the tinguish a sample of carrot from one of chicory, would not allow g fragments of carrot when mixed with chicory, because minute tter vegetable frequently do not contain lactiferous vessels.

with Parsnip.—The parsnip also resembles chicory root very

closely in its structure; the cells are nearly of the same size and fo
dotted vessels are similar, but there are no lactiferous vessels, and t
moreover, contain starch-granules of small size.

Some of the starch-granules in the process of roasting always escape
tion, and thus the substitution of parsnip for chicory, or its admixture
root, may with care always be discovered by means of the microscope.

Adulteration with Mangel-wurzel.—The cells forming the root or
this plant are three or four times larger than those of any of the previo
scribed substances, from which, therefore, it may easily be distinguishe

Various statements have appeared respecting the employment of thi
the adulteration of chicory and coffee.

Adulteration with Beans.—This is a favourite adulteration of both c
chicory, of which we have met with several instances.

The means of distinguishing it have been pointed out in a previous
they relate principally to the size and form of the starch-granules wh
into the structure of the bean.

Adulteration with "COFFINA."—An article has lately been introdu
the market under the attractive title of "Coffina," said to be a "Turkis
and to have been found "highly nutritious" on analysation.

It is in the state of powder, has very much the appearance of coffee i
a very bitter taste, and possesses the odour of lentils.

On an examination of this powder with the microscope, we find it t
entirely of a seed, including even the husk, belonging to some pla
natural family *Leguminosæ*.

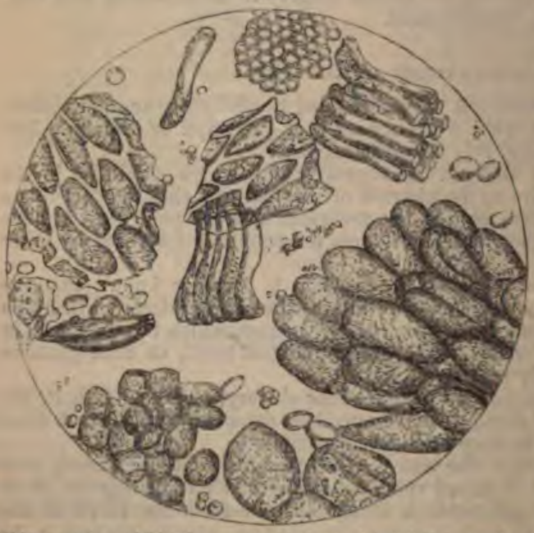
Of this worthless, if not pernicious article, no less than *eighty t*
offered, within the last few days, for sale by a Scotch house, at about
ton, that is, at less than 1½*d.* per pound.

On this single transaction, therefore, the revenue would be defrau
less a sum than 4,480*l.*; and the public of at least four times that amou
nearly 18,000*l.*

This article, the name of which is borrowed from another substance,
it does not contai
ticle, is not recon
as a substitute
cory, but to be u
chicory *in place*

A recent im
of about *one hun*
of lupine-seed fro
into Glasgow, h
correspondent w
the conjecture
"coffina" is ma
them. From a
comparison of th
tures found in "
with those of lupi
we are of opin
this conjecture
founded.

Fig. 38.



This engraving exhibits the several structures detected in a sample of "COFFINA." Drawn with the Camera Lucida, and magnified 140 diameters.

The same firm
a sample of "
was sent, has
been offered *five*
tons of foreign
at 5*l.* per ton, or
three-farthings
Should these fin
chaser, as they wi
less do, if they have not already been bought up, the revenue will be
to the extent of 28,000*l.*, and the public to about 112,000*l.* These a
intended to be used in the adulteration of coffee.

lteration with Roasted Corn.—This adulteration is the one most frequently ed of all; sometimes whole wheat or rye is roasted, at others, an inferior aged description of the ground farina of these is employed, which is first made up into buscuits and then charred.

teration with Biscuit-Powder.—We have been informed, on good autho- at in Whitechapel there exists a manufactory for the express purpose of ng, on a large scale, from an inferior description of flour, a biscuit, to be ground, and exclusively employed in the adulteration of chicory and

ave evidence also that "dog-biscuits" even are used for the same pur-

teration with Burnt Sugar.—Burnt sugar, familiarly known in the grocery "black Jack," is also prepared wholesale for the adulteration of chicory ee.

old mostly in tin canisters, at 1*s*. per lb., and as usually met with, is in f about the size of a bean; these are quite black, exhibit a shining frac- d have the bitter and peculiar taste characteristic of burnt sugar.

ometimes denominated the "coffee refiner;" it is really, however, rather ee colourer," and is employed to impart colour and bitterness to infu- decoctions made from inferior and largely adulterated articles vended he name of coffee.

grocers make a practice of grinding the coffee while the purchaser waits this is done to inspire confidence, and no doubt it frequently has this he customer leaving the shop with the full impression that he has secured ne article. This, however, is often a mistake, for, frequently, near to are boxes containing nibs of chicory broken up into the size of coffee and lumps of "black Jack:" now, a certain quantity of each of these, ul or so of chicory nibs, and a few pieces of "black Jack," find their o the mill as well as the coffee berries.

teration with Red Earth.—If a little chicory powder, as purchased from grocer, be placed between the teeth, it almost constantly feels very gritty, experimenter will most probably be disposed to spit it out as soon as , under the impression that he has got so much earth or dirt in his

nsiderable is the quantity of grit present in many samples of powdered , that the first idea which occurs is, that they are adulterated with some substance: this, however, in general, is not the case, and we believe that or sand contained in them is often derived from the very imperfectly d chicory roots themselves.

e is too much reason to apprehend, however, that earthy and mineral ces are not unfrequently employed in the adulteration of chicory.

will now proceed to detail the results obtained by the examination of us samples of chicory in powder.

s OF THE Microscopical Examination OF Twenty-two Samples OF ORY IN Powder, PURCHASED AT THE Establishments OF DIFFERENT ROPOLITAN Grocers.

ory root is reduced to powder, not by grinding in a mill, but by friction rollers: this mode of preparation, we believe, gives increased facilities teration, because in this way burned vegetable tissues may be so com- d as to render their recognition almost impossible.

make this observation, because we have noticed that of several of the ng samples, more than one half was made up of vegetable matter, l to such a state of division that but little trace of structure was

as been repeatedly stated that ground chicory root when placed on the of water, quickly sinks, and that by this means the adulteration of coffee icory may always be detected. This test in the case of the majority of nples of chicory examined, completely failed, as the powder did not sink, ted on the surface for a considerable time, and continued perfectly dry.

1st Sample.—Purchased in Oxford-street, south side.
Adulterated—with *roasted beans*, and containing a considerable quantity
sand or grit.

2nd Sample.—Purchased in Oxford-street, south side.
Contains *much grit; no adulteration* detected.

3rd Sample.—Purchased in Oxford-street, south side.
Contains *sand; no adulteration* detected.

4th Sample.—Purchased in Oxford-street, south side.
Contains *sand; no adulteration* detected.

5th Sample.—Purchased in Oxford-street, south side.
Contains *much sand; no adulteration* detected.

6th Sample.—Purchased in Oxford-street, north side.
Adulterated—with a considerable quantity of *roasted beans.*

7th Sample.—Purchased in Little Newport-street.
Contains *sand; no adulteration* detected.

8th Sample.—Purchased in Brewer-street, Golden-square.
Contains *sand*, and a small quantity of *coffee.*

9th Sample.—Purchased in Silver-street.
Contains much *sand; no adulteration* detected.

10th Sample.—Purchased in Tyler-street.
Contains *sand; no adulteration* detected.

11th Sample.—Purchased in Walker's-court.
Adulterated—with *much burnt corn*, and contains *sand.*

12th Sample.—Purchased in Seven-dials.
Contains much *sand; no adulteration* detected.

13th Sample.—Purchased in Ryder's-court.
Adulterated—with *roasted corn*, and containing very much *sand.*

14th Sample.—Purchased in Oxford-street.
Adulterated—with a *considerable quantity of roasted beans*, and cont
much *sand.*

15th Sample.—Purchased in Pulteney-street.
Contains a small quantity of *sand; no adulteration* detected.

16th Sample.—Purchased in Little Earl-street.
Adulterated—with *roasted corn.*

17th Sample.—Purchased in Little Windmill-street.
Adulterated—with an *immense quantity of roasted beans* and much *sand.*

18th Sample.—Purchased in Panton-street.
Contained a small quantity of *sand; no adulteration* detected.

19th Sample.—Purchased in Tottenham-court-road.
Adulterated—with a *small quantity of roasted corn*, and containing a
sand.

20th Sample.—Purchased in Newport-market.
Containing a *small quantity of roasted farina*, and much *sand.*

21st Sample.—Purchased in Marshall-street.
Contains a small quantity of *coffee: no adulteration* detected.

22nd Sample.—Purchased in Grafton-street.
No adulteration detected; contains much *sand.*

From an examination of the above *Twenty-two* analyses, it appears
less than *nine*, or *nearly half* of the samples examined, were adulterated.

The prices demanded for the several samples varied from *5d.* to 1*s.*
the ordinary charge being 8*d.* The price of chicory in powder to the
ranges in general from 20*s.* to 32*s.* per cwt.; thus the profit of the retail
on the sale of chicory powder is seldom under cent. per cent., and often
above it.

RESULTS OF THE MICROSCOPIC EXAMINATION OF SAMPLES OF CHICO POWDER OBTAINED FROM WHOLESALE DEALERS.

The following samples, with two exceptions, were forwarded to an ex
firm in the City, which hitherto has never made use of chicory in its
it may therefore fairly be inferred that they were superior in quality

o those usually offered; indeed, this remark applies to *samples* in general,
n most cases are better than the articles subsequently supplied.

ample. — Price 26*s.* per cwt.; contains a considerable quantity of *sand;*
dulteration detected.

ample. — Foreign chicory, price 52*s.* per cwt.; contains much *sand; no*
teration detected.

ample. — Price 32*s.* per cwt.; *adulterated* with *roasted corn*, and contains
.

ample. — English chicory, price 30*s.* per cwt.; so highly burnt as to be
st black, and reduced to charcoal; mere rubbish.

ample. — English chicory, price 30*s.* per cwt.; contained much *sand; no*
teration detected.

ample. — Price 24*s.* 6*d.* per cwt.; *adulterated* with *roasted corn*, and con-
sand.

ample. — Guernsey chicory, price 30*s.* per cwt.; containing much *sand;*
dulteration detected.

ample. — Price 26*s.* per cwt.; containing a little *sand; no adulteration*
ted.

mple. — English chicory, price 26*s.* per cwt.; *adulterated* with *much*
ed corn, and containing very much *sand.*

ample. — Foreign chicory, price 42*s.* per cwt.; containing much *sand;*
dulteration detected.

ample. — This sample was supplied to a coffee-house keeper by a whole-
and retail dealer in the City.

terated — with *ground acorns.*

mple. — We publish the name in the following case, for the same reasons
have induced us to make known the names of other parties vending
in sealed packages, the wrappers of which are made the vehicle of ad-
nents.

"An Improvement to Coffee.
Genuine Chicory Powder,
manufactured by
J. S. FRY & SONS, Bristol,
From the finest root.
Use it in proportion of one tea-spoonful to three of coffee."

terated — with *much roasted corn.*

ublication of the above analysis led to some correspondence between the
Fry and ourselves; this was brought to a termination satisfactory to
ties by the publication in "The Lancet" of the following observations: —
the full and complete accuracy of the statements and analyses of the
sion not a reasonable doubt can now be entertained. It will, we think,
ersally admitted that nothing could exceed the care and scientific accu-
which the Reports on Food and its Adulterations have been charac-
hroughout. Of the truth of this remark, we have received abundant
clusive evidence on all sides; but we need only refer to one fact to
rate its perfect correctness. The reports in question have now been
d with considerable regularity for upwards of two years; during this
nany hundreds of analyses have been made, and names and addresses
d, yet in one instance only have our results been seriously called in
. We allude to the case of Messrs. FRY, which occurred nearly two
ce. On that occasion we felt ourselves bound to publish the result of
analysis of a packet of chicory which came to our hands, bearing the
of Messrs. FRY. It was of an unfavourable nature. On the other hand,
ntlemen laid before us the reports of a chemical and microscopical in-
specting it, conducted by persons of much scientific reputation, certi-
absence of any admixture. Whatever may have been the cause of the
ncy, enough has transpired to satisfy us that Messrs. FRY themselves
irely free from blame. Other packages of their manufacture have since
cured, which, on examination, have been found quite free from adulte-
admixture of any kind. We refer to this matter, because, knowing

the high character of the Messrs. Fry, we consider this explanation due both to them and to ourselves. We have, then, great reason to look back upon the past career of the Analytical Sanitary Commission with the highest satisfaction. The analyses, having been no less accurate than the results of the labours of the Commission, have been important to the public and the profession."

We have now shown,

1st. That chicory, an article used to adulterate another article, is itself largely adulterated.

2nd. That the dealers in or manufacturers of chicory are in many cases the parties who practise this adulteration.

We are sorry, however, to say, that in those instances in which the retail grocers do not themselves adulterate the chicory they vend, we are unable to acquit them of guilty knowledge of and participation in the fraud: this knowledge is displayed in the fact that the fraudulent grocer frequently purchases chicory in powder, at a price at which it is not possible to procure genuine chicory.

Review of Reasons urged both For and Against the Admixture of Chicory with Coffee.

Various reasons have been urged both in favour of and against the "adulteration," or, as the Chancellor more gently phrases it, the "mixing" of chicory with coffee: these we will next proceed to consider.

In *favour of the adulteration* it is alleged,—

First, that the *admixture of chicory with coffee improves coffee*, and that *such addition is approved of by the public.*

In order to ascertain whether the addition of chicory to coffee be really an improvement, we prepared three infusions, one of coffee, another of chicory, and the third of both these mixed in the proportion of three-fourths coffee and one-fourth chicory.

The *infusion of coffee* was perfectly transparent, and of a dark and rich brown colour; it emitted an odour in a high degree penetrating and refreshing, and to the taste it was agreeable, and rather bitter.

Having been taken for a few minutes, it produced a feeling of general warmth and a state of bodily and mental activity and invigoration.

The *infusion of chicory* was opaque, staining the sides of the vessel containing it; it possessed a heavy, though perhaps some persons might be of opinion not a disagreeable smell, wholly unlike, however, the volatile and diffusive odour of coffee; in taste it was more bitter than the coffee, with a certain degree of sweetness.

Having been swallowed for a few minutes, it occasioned a feeling of weight the stomach, and a general heaviness and indisposition to bodily and mental exertion.

The combined infusion of chicory and coffee partook, to a great extent, the characters of the infusion of genuine coffee, as might be anticipated from the large quantity of coffee it contained.

Altogether, we were unable to bring ourselves to believe that the addition chicory to coffee in the proportion of twenty-five per cent. of the former was an improvement; on the contrary, we were satisfied that the quality of the beverage was greatly impaired by the addition.

Persons who are foolish enough to regard a slight sensation of weight and fulness in the region of the stomach—symptoms really of incipient indigestion —as evidences of the beverage being possessed of increased "strength" and "body," might possibly be brought to consider the addition an improvement.

In contrasting the properties of chicory and coffee together, we would once more observe it must not be forgotten that the former article is wholl titute of that peculiar principle "*caffeine*," upon which the virtues of depend, and that therefore for every ounce of chicory in a pound of there is so much the less of that stimulating and invigorating nitro product.

Allowing, however, for the sake of argument, that the admixture of chi noderate proportions is in the opinion of some persons an improvement, it is y certain that by others it is not considered to be so; and such, therefore, ht surely *to be allowed a choice*, and not be compelled, as at present they uently are, to drink chicory although they dislike it.

ut the admixture of chicory with coffee in the proportion of twenty-five per t., the utmost that can be allowed by any person to constitute an improve- nt, does not in general satisfy the desire for profit on the part of the grocer; uses, in most cases, a very much larger proportion of chicory than this, and shilling coffee, "*the poor man's beverage*," contains one-half or three-fourths ory, and in some instances consists entirely of it. Now no truthful person assert that chicory in these, the more common proportions, is an improve- nt to coffee.

econd, that *the use of chicory increases the consumption of coffee.*

his statement, although recently put forth by no less an authority than the ncellor of the Exchequer, is just the very reverse of the truth, which is, that use of chicory diminishes the consumption of coffee. This we have already rly proved, and it is not necessary that we discuss this point again. It is led.

hird, that *the poor man, by the employment of chicory, has an article placed hin his reach which otherwise he could not obtain.*

his argument, although specious, is utterly fallacious.

enuine coffee, ground, or in the berry, may now be obtained at numerous pectable establishments, at 1*s*. 2*d*. and 1*s*. 4*d*. the pound, this article costing grocer more than three-fourths of the sum he demands for it.

he mixture of chicory and coffee is never sold under 1*s*. per lb., and the cost his to the grocer very frequently does not exceed 3*d*. a pound.

hich of these two articles, therefore, we ask, is the *best poor man's bargain?*

hilling coffee, as vended at the present, is vile and often deleterious rubbish, we recommend the poor man never to purchase it.

e say, therefore, that so far from the poor man being benefited by the use hicory, that out of every shilling he spends in what is falsely denominated ee, he is frequently robbed of 9*d*.

e can well understand how the poor man or the poor man's wife, having, on aturday night, only a few shillings to spend, and desiring to make this go as as possible, is induced to purchase the cheapest articles he or she can pro- e, overlooking the fact, that what professes to be the cheapest is often in ity the dearest in the end.

e wish the poor man, therefore, clearly to understand, that chicory is not to ompared to coffee in any respect, and we would have him avoid the "cheap cutting shops," distinguished by large placards and huge piles of damaged ds, and buy his coffee at some house of known and acknowledged reputation respectability.

pprehensive that Government will be forced to take notice of the scandalous tices now so rife in the article of coffee, the adulterating grocers have already un to raise the cry of "dear coffee," and they tell us, that if the admixture hicory with coffee be prohibited, the price of the latter article will be 2*s*. the nd.

he answer to this statement is, that excellent *genuine coffee* may now be ob- ed at establishments which do not use chicory in their business at all, at es varying from 1*s*. 2*d*. to 1*s*. 6*d*. per pound.

ourth, that *the law sanctions the adulteration of coffee with chicory*, and efore that the grocer, in mixing chicory with coffee, is guilty of no fraud.

s the law at present stands, it must be conceded, we are sorry to say, that ixing chicory with coffee the grocer does not violate the law, but only does which the executive and its officers, to their shame be it said, not alone tion, but actually recommend.

e hold, however, that in vending an article as coffee which is not coffee, the er is guilty of a moral fraud, and that which is morally wrong no act of iament and no ministers can make morally right.

fth, and lastly, it is alleged that there is no necessity for legislative inter- nce, since, *by buying the coffee-berries in the whole state, the public can ect itself.*

Those who use this argument cannot but be aware how inefficient, practically, is the protection here referred to.

The poor man has not the money wherewith to purchase a mill; and if he had, working early and late, rising at six in the morning, and going to bed late at night, what time or spirit has he to attend to such matters?

Again: others not so poor, and who are in a position to make the necessary purchase, are perhaps equally engaged, or ignorant of the extent to which they are cheated.

Even of those who have both money and leisure we affirm that not one in twenty avails himself of the protection which the purchase of the whole berry affords; nor, since he pays a fair price for an article which he specifies, ought he to be called upon to adopt measures of extraordinary precaution against fraud.

We are not disposed, however, to underrate the value of this means of protection, and we hope shortly to be able to announce where efficient coffee-mills may be procured at a reasonable cost.

We put it to coffee-merchants and respectable dealers whether it be not advisable that they should themselves take some steps to supply the public with cheap and effective coffee-mills.

We have now to consider the chief arguments which have been or may be advanced against the adulteration of coffee with chicory.

Against this practice we allege,

First: that such adulteration *necessitates the commission of a moral fraud*, and further, that it is frequently made the cloak for pecuniary fraud and extortion.

When a purchaser enters a shop, asks for an article, pays the price demanded for it, he has a right to expect that he obtains that for which he asks, and not a mixture of two different things, one of which he probably positively objects to, and the relative proportions of which are regulated by the will and conscience of the vendor. The grocer who, under such circumstances, places in the hands of the purchaser an adulterated commodity, commits a moral, and frequently a pecuniary fraud.

We will suppose the following case of poisoning, not an improbable or unfrequent one:—An infant has been given an overdose of Godfrey's cordial; the proper remedy is a strong infusion of coffee—the coffee already in the house, inasmuch as it is the most readily obtained, is used, and consists principally or perhaps entirely of chicory. *The child dies.* Who is the party morally responsible in this case?

Second: that *it is unjust to the producer* of coffee.

The grower of coffee has at least a right to demand, in consideration of the heavy tax which he pays for the privilege of being permitted to import his coffee into England for disposal, that the sale of the article, and its estimation with the public, be not injured by the practice of adulteration, carried on under the sanction, and with the connivance, of the legislature.

The payers of duty on other excisable articles are protected against adulteration by law, and the coffee-grower has a full right to demand, in common honesty, the same amount of protection.

Third: that *the revenue is injured.*

Whatever lessens the consumption of an excisable article, of course injures the revenue. It has been proved that the mixing of chicory with coffee lessens the consumption of coffee, and therefore, by so much is the revenue diminished and injured.

If the loss in the revenue were so much gain to the public, there would be less reason to complain, but this is not the case; the advantage is pocketed by unprincipled grocers.

Fourth: that *the public is defrauded.*

That the public, and especially that large section of it, the poor, is extensively defrauded by the adulteration of coffee with chicory, to say nothing of roasted corn, beans, dog biscuits, &c., has already been clearly proved. Let those who entertain any doubts upon the subject, consult the Table of Analyses which we gave in our Report on Coffee.

We have now clearly shown that the disadvantages and evils resulting from *the mixture of* chicory with coffee, in the manner and to the extent now practised, are great and manifold, and that they demand the application of a suitable remedy.

The remedy which we propose is simple, moderate, and just: it is, that the "Treasury minute," authorising the mixture of chicory with coffee, be rescinded. The effect of this would be, to place coffee upon the same footing with all other excisable articles, as tea, pepper, &c., and that penalties would attach to its adulteration.

Chicory would of course still be sold; but in place of being so clandestinely, it would be vended openly, and under its proper name, and at its fair value.

Public morality, the interests of the revenue, of the grower, the consumer of coffee, and the honest tradesman alike require the adoption of the remedy here pointed out.

MUSTARD, AND ITS ADULTERATIONS.

THE plants from which mustard is obtained are, *Sinapis nigra*, or black, and *Sinapis alba*, or white mustard; they belong to the natural family *Cruciferæ*.

The black mustard-plant is distinguished by its seed vessels, which are smooth, and the colour of the seeds themselves, which are reddish, or blackish brown.

In the white mustard-plant the seed vessels or pods are clothed with hairs, which render them rough, and the seeds are yellow.

The two species of mustard differ in properties as well as in botanical characters.

The seeds of *S. nigra* are more pungent than those of *S. alba*, but there are other differences.

Analysis has detected in black mustard-seed several distinct chemical compounds—*Myronic acid*, *Myrocyne*, *a volatile oil*, and *a fixed oil of mustard*.

Myronic acid is an inodorous, non-volatile, bitter, and non-crystallisable substance, containing nitrogen and sulphur, and forming salts with bases. The characteristic property of this substance is, that it yields, with myrocyne, the volatile oil of mustard.

Myrocyne, the *emulsin* of black mustard, yields, as already noticed, with myronic acid, the volatile oil of mustard. "It has considerable resemblance to vegetable albumen and emulsin, but as it cannot be replaced by either of these substances in the development of the volatile oil, it must be regarded as a substance *sui generis*. It is soluble in water; but is coagulated by heat, alcohol, and acids, and in this state it loses the power of acting on the myronates, and of yielding the volatile oil."—*Pereira*.

The *volatile oil of mustard* does not pre-exist in black mustard-seeds, but is formed, as already observed, by the mutual action of myronic acid and myrocyne in cold or warm water; it is this oil which gives to mustard its penetrating odour, sharp burning taste, and its acrid, rubefacient, and vesicant properties: it contains nitrogen and sulphur in its composition.

The above details are of practical interest and importance, for since heat coagulates myrocyne, and this substance is necessary to the formation of the volatile oil upon which the greater part of the active properties of mustard depends, it is clear that water either cold or warm only, should be employed in the mixing of mustard.

The *fixed oil of mustard* is usually procured from the siftings or dressings of mustard, which consist mainly of husk: it is stated to constitute about twenty-eight per cent. of the seeds.

Of the composition of white mustard we find the following account in Pereira's "Materia Medica."

"Robiquet and Boutron (*Journ. de Pharm.*, xvii. p. 279.), however, have proved, that white mustard contains neither volatile oil, nor any substance capable of producing it, but owes its activity to a *non-volatile acrid substance*, which does not pre-exist in the seeds, but is readily formed in them under certain conditions. Another chemical peculiarity of white mustard is, that it contains *sulpho-sinapisin.* (Henry and Garrot, *Journ. de Chim. Méd.*, i. 441.) Hence, while sesquichloride of iron strikes a deep red colour in an infusion of white mustard, it merely communicates an orange tint to the infusion of black mustard. Moreover, the thick mucilaginous liquor obtained by digesting the seeds of white mustard in cold water is peculiar to them. (Cadet, *Journ. de Pharm.*, xiii. 191.) Simon (*Journ. de Pharm.*, xxv. 370.) has announced the existence of a new principle, which he calls *erucin*."

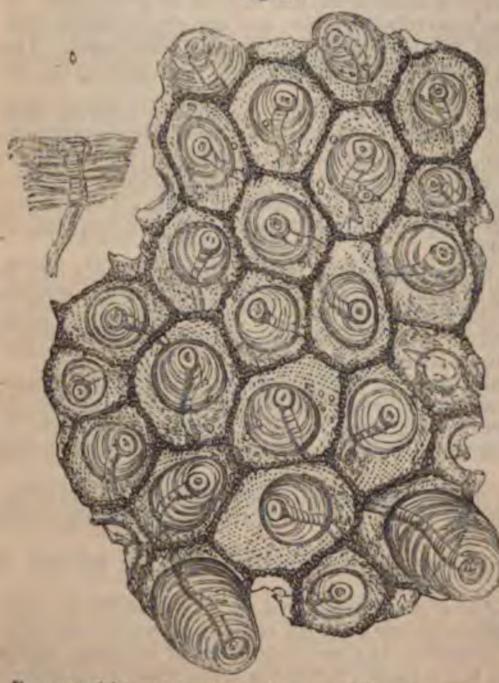
The young or seed leaves of white mustard are used for salad.

Both species are indigenous, and may commonly be seen in flower, in the month of June, in waste places and fields. In the brick fields in the neighbourhood of Notting-hill, they grow in great quantities.

M'Culloch's "Commercial Dictionary" contains the following interesting particulars in relation to the growth &c., of mustard:—

"It was formerly extensively cultivated in Durham, but it is now seldom seen in that county. At present it is principally raised in the neighbourhood of York, and throughout other parts of the North Riding; and being manufactured in the city of York, is afterwards sold under the name of Durham mustard. Two quarters an acre are reckoned a good crop. Mustard is of considerable importance in the materia medica, and is extensively used as a condiment. It was not, however, known in its present form, at our tables, till 1720. The seed had previously been merely pounded in a mortar, and in that rude state separated from the integuments, and prepared for use. But at the period referred to, it occurred to a woman, of the name of Clements, residing in Durham, to grind the seed in a mill, and to treat the meal in the same way that flour is treated. Her mustard was, in consequence, very superior; and being approved by George I., speedily came into general use. Mrs. Clements kept her secret for a considerable time, and acquired a competent fortune. In Bengal, and other eastern countries, mustard is extensively cultivated, as rape is in Europe, for the purpose of yielding oil." (Bailey's *Survey of Durham*, p. 147.; Loudon's *Encyclopædia of Agriculture.*)

Fig. 39.



Fragment of the *outer* membrane of the seed of WHITE MUSTARD. *Drawn with the Camera Lucida, and magnified 220 diameters.*

The subjoined particulars, in reference to the manufacture of mustard, as furnished by a manufacturer, are given by Pereira:—

"The seeds of both black and white mustard are first crushed between rollers, and then pounded in mortars. The pounded seeds are then sifted. The residue in the sieve is called *dressings*, or *siftings*; what passes through is *impure flour of mustard*. The latter, by a second sifting, yields *pure flour of mustard*, and a second quantity of dressings. By pressure, the dressings yield a fixed oil, which is used for mixing with rape and other oils."

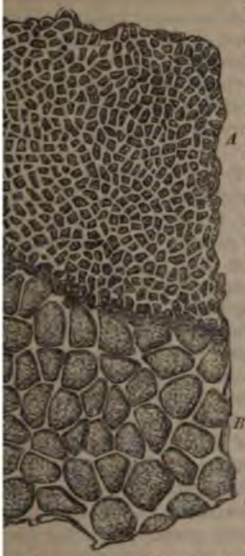
STRUCTURE OF MUSTARD-SEED.

Every entire seed consists of two parts, the husk and the seed proper.

The husk of white mustard-seed is constituted of three distinct membranes.

The *outer* membrane is transparent, and mucilaginous; it consists of a layer ent kinds of cells of large size and very peculiar structure; d are of an hexagonal figure, and united by their edges so as embrane, the centre of each cell being perforated; the cells of the second kind occupy the apertures which exist in the previously described cells, and they are themselves traversed by a somewhat funnel-shaped tube, which appears to terminate on the surface of the seed: immersed in water, these cells swell up to several times their original volume, occasion the rupture of the hexagonal cells, and become themselves much wrinkled or corrugated, the extremity of the tubes in some cases being seen protruding from the proximate termination of the cells.

ig. 40.



nd *inner* tunics of the mustard-
g and lying upon a part of the

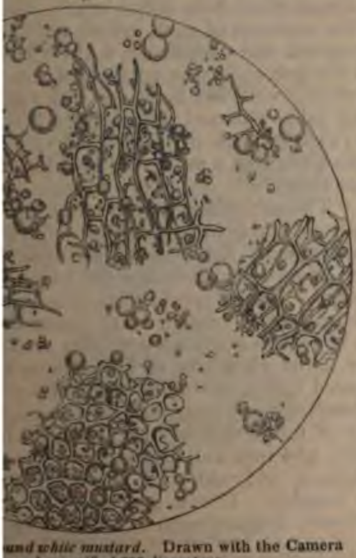
e tunic. Drawn with the Ca-
ified 220 diameters.
er tunic, showing the structure
wn with the Camera Lucida, and
.

It has been noticed that when white mustard-seeds are digested in water, a thick mucilaginous liquid is obtained: the source of the mucilage does not appear to have been pointed out; it is certainly, however, derived from the cells forming the tissue above described.

The *middle* tunic consists of a single layer of very minute cells, of an angular form; it is in the cavities of these that the chief part of the colouring matter possessed by the husk is seated.

The *inner* membrane also consists of a single layer of angular cells, which, however, are several times larger than those constituting the middle tunic.

Fig. 41.



und white mustard. Drawn with the Camera
, and magnified 220 diameters.

The *seed* itself is of a bright yellow colour, and of a soft, waxy consistence, which arises from the quantity of oil it contains; it consists of innumerable very minute cells, in the cavities of which the oil and other active principles are contained.

Notwithstanding the terms "flour" and "farina" of mustard commonly employed, ripe mustard-seed does not contain a single starch granule, as may be ascertained by means of iodine and the microscope.

In black mustard-seed, the outer membrane consists only of the large hexagonal transparent cells disposed in two or three layers, these not being perforated in the centre like those of white mustard; in other respects the structures resemble those of white mustard-seed.

ADULTERATIONS OF MUSTARD.

We find the celebrated author of "Death in the Pot," in the year 1820, publishing the following observations in reference to the adulteration of mustard:—

"Genuine mustard, either in powder, or in the state of a paste, ready for use, is perhaps rarely to be met with in the shops. The article sold under the name of *patent mustard* is usually a mixture of mustard and common wheaten flour, with a portion of cayenne pepper, and a large quantity of bay-salt, made with water into a paste, ready for use. Some manufacturers adulterate their mustard with radish-seed and pease-flour.

"It has often been stated that a fine yellow colour is given to mustard by means of turmeric. We doubt the truth of this assertion. The presence of the minutest quantity of turmeric may instantly be detected by adding to the mustard a few drops of a solution of potash, or any other alkali, which changes the bright-yellow colour to a brown or deep orange tint.

"Two ounces and a half of cayenne pepper, a pound and a half of bay-salt, eight pounds of mustard-flour, and a pound and a half of wheaten flour, made into a stiff paste, with the requisite quantity of water, in which the bay-salt is previously dissolved, forms the *patent mustard* sold in pots. The salt and cayenne-pepper contribute materially to the keeping of ready-made mustard."

Professor Brande*, in 1839, writes—

"The bright-yellow powder, sold under the name of *flour of mustard*, and used at the table, is a compound of powdered black and pale mustard-seed, cayenne pepper, wheat-flour, and turmeric."

Dr. Ure, in his "Dictionary," published in 1844, describes two receipts for the manufacture and adulteration of mustard.

"M. Lenormand gives the following prescription for preparing mustard for the table:—

"With two pounds of very fine flour of mustard mix half an ounce of each of the following plants:—Parsley, chervil, celery, and tarragon, along with a clove of garlic, and twelve salt anchovies, all well minced. The whole is to be triturated with the flour of mustard till the mixture becomes uniform. A little grape-must, or sugar, is to be added, to give the requisite sweetness; then one ounce of salt, with sufficient water to form a thinnish paste by rubbing in a mortar. With this paste, the mustard-pots being nearly filled, a red-hot poker is to be thrust down into the contents of each, which removes (it is said) some of the acrimony of the mustard, and evaporates a little water, so as to make room for pouring a little vinegar upon the surface of the paste. Such table mustard not only keeps perfectly well, but improves with age."

"The mode of preparing table mustard patented by M. Soyer, consisted in steeping mustard-seed in twice its bulk of weak wood vinegar for eight days, then grinding the whole into a paste in a mill, putting it into pots, and thrusting a red-hot poker into each of them."

According to Mitchell: "The substances employed in the adulteration of this condiment are not generally injurious to health, they only weaken the strength of the material. Pea-flour, ordinary flour, and linseed-cake, ground very fine, with turmeric powder as a colouring matter, are the bodies used in weakening the usual pungency of mustard. The mineral substances are, yellow ochre, and, as I have been informed, chromate of lead in small quantities, to give a bright yellow to mustard that has had much coloured vegetable matter, as linseed-meal, added to it. I have never found chromate of lead in any sample I have examined, although I am assured that it is occasionally employed.

"The best method of detecting pea-flour, ordinary flour, linseed-meal, &c., is, to take a given weight of mustard-seed and pulverise it finely, add to it ten times its weight of water, and mix well together. Take the same quantity of the mustard to be examined, and add to it the same amount of water as before (ten times its own weight). It will now most likely happen that the mixture of water and powdered mustard-seed will have a much more punge e other; if so, water is to be added, until both taste alike; from the water added, the probable amount of adulteration may be approxi- ned. This is, however, not an absolutely decisive test, but it is the h which I am at present acquainted, that is readily performed."

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* Dictionary of Materia Medica and Pharmacy.

ly marvellous that any persons writing in the present day on the of food should have so overlooked the application of the microscope tion of adulteration, as have Messrs. Mitchell and Normandy, the cent English writers on the subject. The method pointed out by ll for the detection of the admixture of pea-flour, linseed-meal, &c., is extremely puerile.

to Pereira, "*The common flour of mustard* of the shops is adulter- ur (wheaten), coloured by turmeric and rendered hot by pod pepper." , in his "Hand-book of Chemical Analysis," does not notice its adulterations at all.

ion with Radish-seed.—It has been stated that radish-seed is some- yed in the adulteration of mustard; this we are disposed to doubt, il price of radish-seed, usually a shilling a quart, renders it much this purpose.

re, radish-seed resembles very closely black mustard-seed; two of nes and the substance of the seed itself are very similar, so that, if ld be extremely difficult to detect.

ion with Rape-seed.—Rape, unlike radish-seed, is very cheap, and e possible, that in some cases it may be used to adulterate mustard; however, think that it is so frequently; because an article not less mmonly employed, which probably better answers the purpose.

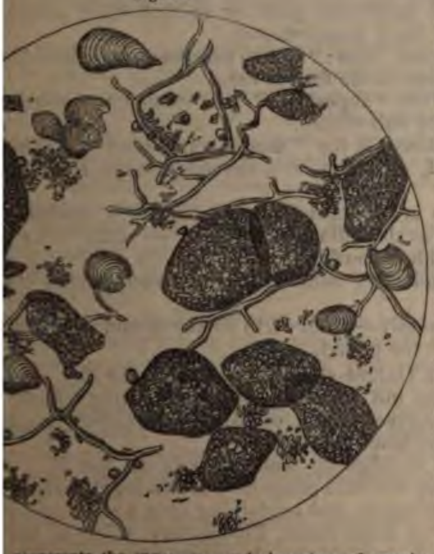
resembles black mustard-seed very closely in structure.

ion with Wheaten Flour.—The characters of wheaten flour have y more than once partially described; in our next Report, these ill be considered more fully, and an engraving given illustrative of

quantities of wheaten flour are employed in the adulteration of d many samples almost entirely consist of it.

en stated that pea-flour is sometimes used: out of fifty samples of ich we have submitted to examination, we have not met with a nce of adulteration with any other farina than wheaten flour.

Fig. 42.



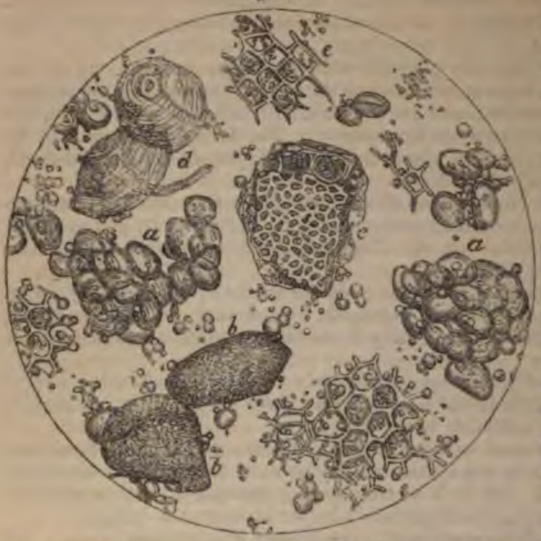
represents the appearance and characters of *genuine* eric. Drawn with the Camera Lucida, and magnified 220

Adulteration with Turmeric Powder.—Turmeric powder is the ground tuber of *Curcuma longa*, one of the *Zingiberaceæ*: it is of a dark yellow colour, and consists of large cells; some of these are loosely imbedded in a reticular tissue, but others, and these the majority, are quite free: they may be recognised with facility, under the microscope, by their size and bright yellow colour.

When crushed, each cell is found to contain colouring matter, as well as a number of starch granules, resembling closely those of Curcuma arrowroot, already described and figured.

On the application of iodine the cells become of a deep-blue, and with potash, of a reddish colour.

Fig. 43.



This engraving represents the articles detected in a sample of "*double superfine* MUSTARD," marked with the names of Messrs. J. & J. Colman: *a a*, *wheaten flour*; *b b*, cells of *turmeric powder*; *c*, portion of *husk of black mustard*; *d*, cells of outer tunic of *white mustard-seed*; *e e*, fragments of the *seed* itself.

Although we have examined a large number of samples of mustard, in no instance have we found turmeric powder to be absent.

By some means or other—probably by moisture and heat—the turmeric powder is made to part with a portion of its colouring-matter to the flour which enters so largely into the composition of the mustard of the shops.

Adulteration with Pod or Capsicum Pepper.—It is stated that pod-pepper is commonly present in mustard: we have diligently searched for it, but have not hitherto detected it in any sample.

Before proceeding to give the results of the examination of samples of mustard, we wish to direct the attention of the reader to the accompanying figure.

RESULTS OF THE MICROSCOPICAL EXAMINATION OF FORTY-TWO SAMPLES OF MUSTARD, OBTAINED AT THE ESTABLISHMENTS OF DIFFERENT GROCERS RESIDENT IN THE METROPOLIS.

Four qualities of mustard are supplied by the manufacturer.

The first is called "seconds:" it is usually of a bright yellow colour, but is thickly studded over with numerous black or reddish-black points: these are fragments of the husks of black mustard-seed.

The next quality is termed "fine:" it also presents a considerable number of black specks, but fewer than in the former case.

The third quality is called "superfine:" it is spotted to a much less extent, although minute specks are still visible.

The fourth, or best quality, is the "double-superfine:" in this the eye can scarcely detect husk at all, although, with the microscope, a little may still be discovered.

These several qualities are vended to the public by a wholesale and retail establishment in the City at the following rates: "seconds," 5*d.*; "fine," "superfine," 11*d.*; "double-superfine," 1*s.* 2*d.*, per lb.

The qualities of the following samples varied much—from "seconds" to "double-superfine."

The price also varied greatly—from 1*s.* to 2*s.* the pound; the ordinary charge made being 1*s.* and 1*s.* 4*d.* the pound.

1*st Sample.*—Purchased in Oxford-street, price 1*s.* 4*d.* per lb.
Adulterated—possessing but little pungency, consisting chiefly of *wheaten flour*, coloured with *turmeric*, and containing numerous fragments of the husk of both white and black mustard-seed.

2*nd Sample.*—Purchased in Edgware-road, price 1*s.* 4*d.* per lb.
Adulterated—possessing but little pungency, consisting principally of *wheaten flour*, coloured with *turmeric*, and containing only a small quantity of husk.

3*rd Sample.*—Purchased in High-street, Bloomsbury, price 1*s.* per lb.
Adulterated—possessing scarcely any pungency, about equal to "seconds" in quality and appearance, consisting principally of *wheaten flour*, coloured

ith *turmeric*, and containing a considerable quantity of husk of black ustard-seed.

ample.—Purchased in New Church-street, Edgware-road, price 1*s.* 4*d.* er lb.

lterated—possessing but little pungency, consisting principally of *heaten flour*, coloured with *turmeric*, and containing much husk of white nd a little of black mustard-seed.

ample.—Purchased in James-street, Lisson-grove, price 1*s.* per lb.

lterated—possessing but little pungency, about equal to "seconds," nsisting principally of *wheaten flour*, coloured with *turmeric*, and con-ining a considerable quantity of husk of both white and black mustard-ed.

ample.—Purchased in James-street, Edgware-road, price 1*s.* 4*d.* per lb.

lterated—possessing much more pungency, but still consisting prin-ipally of *wheaten flour*, coloured with *turmeric*.

ample.—Purchased in Tottenham-court-road, price 1*s.* per lb.

lterated—possessing but little pungency, consisting principally of *wheaten our*, coloured with *turmeric*, and containing much husk of both white and lack mustard-seed.

ample.—Purchased in Tottenham-court-road, price 1*s.* per lb.

lterated—possessing but very little pungency, consisting principally of *heaten flour*, coloured with *turmeric*, and containing a moderate quantity f husk.

ample.—Purchased in Goodge-street, Tottenham-court-road, price 1*s.* er lb.

lterated—possessing but very little pungency, and about equal to seconds" in quality, consisting principally of *wheaten flour*, coloured ith *turmeric*, and containing rather much husk of black and a little only f white mustard-seed.

Sample.—Purchased in Tottenham-court-road, price 1*s.* per lb.

lterated—possessing extremely little pungency, consisting principally f *wheaten flour*, coloured with *turmeric*, and containing a moderate quan-ity of husk of black and only a small quantity of husk of white mustard-eed.

Sample.—Purchased in Chapel-street, Somers-town, price 1*s.* per lb.

lterated—possessing extremely little pungency, consisting principally of *heaten flour*, coloured with *turmeric*, and much husk of black mustard-eed.

Sample.—Purchased in Skinner-street, Somers-town, price 1*s.* per lb.

lterated—possessing rather more pungency than usual, consisting prin-ipally of *wheaten flour*, coloured with *turmeric*, and containing a moderate uantity of husk of both white and black mustard-seed.

Sample.—Purchased in Skinner-street, Somers-town, price 1*s.* 4*d.* per lb.

lterated—possessing extremely little pungency, consisting chiefly of *heaten flour*, coloured with *turmeric*, and containing husk of both white nd black mustard-seed, and most of the former.

Sample.—Purchased in Brewer-street, Somers-town, price 2*s.* per lb.

lterated—possessing rather more pungency than usual, but consisting rincipally of *wheaten flour*, coloured with *turmeric*, and containing a small uantity of husk only.

Sample.—Purchased in High-street, Whitechapel, price 1*s.* per lb.

lterated—possessing rather more pungency than usual, consisting prin-ipally of *wheaten flour*, highly coloured with *turmeric*, and containing a oderate quantity of husk.

Sample.—Purchased in Drury-lane, price 1*s.* 6*d.* per lb.

lterated—possessing but little pungency, although rather more than ual, consisting principally of *wheaten flour*, coloured with *turmeric*, and ntaining a considerable quantity of husk of both black and white mustard-ed.

mple.—Purchased in Lower-marsh, Lambeth, price 1*s.* 4*d.* per lb.

lterated—consisting principally of *wheaten flour*, coloured with *turmeric*, d containing a considerable quantity of husk.

18*th Sample.* — Purchased in Westminster-road, price 2*s.* per lb.
Adulterated — possessing more pungency than ordinary, consisting principally of *wheaten flour*, coloured with *turmeric*, and not containing much husk.

19*th Sample.* — Purchased in Lower-marsh, Lambeth, price 1*s.* 4*d.* per lb.
Adulterated — possessing rather more pungency than usual, consisting principally of *wheaten flour*, coloured with *turmeric*, and containing a considerable quantity of husk.

20*th Sample.* — Purchased in Clare-market, price 1*s.* 4*d.* per lb.
Adulterated — consisting principally of *wheaten flour*, coloured with *turmeric*, and containing a moderate quantity of husk of both black and white mustard-seed.

The following samples were contained in packages put up in tin-foil, and had upon them either the names of the manufacturer or grocer by whom they were sold. We refrain from giving the names of the grocers from whom the samples were purchased, because the manufacturers are almost invariably the parties by whom the adulterations are practised, and therefore the chief responsibility rests with them.

21*st Sample.* — Purchased in the Strand.

"Extra-superfine Durham Mustard."
Warranted of the best quality, 1*s.* 6*d.* per lb.

Adulterated — colour brownish; possessed of considerable pungency; containing a large proportion of *wheaten flour*, and a small quantity of *turmeric* only; but little husk visible.

22*nd Sample.* — Purchased in Castle-street, Oxford-street, price 1*s.* 8*d.* per lb. Labelled thus: —

"GRIMSDALE'S
Genuine Superfine
Mustard."

Adulterated — pungency not great; containing a very large proportion of *wheaten flour*; highly coloured with *turmeric* powder; but little husk visible.

23*rd Sample.* — Purchased on Ludgate-hill, price 1*s.* 6*d.* per lb. Labelled thus: —

"Finest Durham Mustard."

Adulterated — possessing more than ordinary pungency; containing a very large proportion of *wheaten flour*; coloured with *turmeric*; but little husk visible.

24*th Sample.* — Purchased in Oxford-street, price 1*s.* 8*d.* per lb. Labelled as the last —

"Finest Durham Mustard."

Adulterated — possessing more than usual pungency; containing a very large proportion of *wheaten flour*; coloured with *turmeric*; but little husk visible.

25*th Sample.* — Purchased in Oxford-street, price 1*s.* 4*d.* per lb. Labelled —

"Fine Durham
Mustard."

Adulterated — possessing considerable pungency; containing a very large proportion of *wheaten flour*; coloured with *turmeric*; with but little husk.

26*th Sample.* — Purchased in Drury-lane, price 1*s.* 4*d.* per lb. Labelled —

"Double Superfine
Durham Mustard."

Adulterated — possessing but little pungency; consisting principally of *wheaten flour*; highly coloured with *turmeric*, and containing much husk.

The parties named below are MANUFACTURERS OF MUSTARD. Many of the samples were obtained from casks branded with the following names, and also with letters indicating the qualities.

27*th*, 28*th*, 29*th*, and 30*th Samples.* — FINCH & Co.

A sample of each of the four qualities made was submitted to examination. *All were adulterated.* The samples named "seconds" and "fine" possessed but *little pungency*, consisted principally of *wheaten flour*, coloured with *turmeric*, and

ined much husk. The samples marked "superfine" and "double superfine"
ssed considerable pungency, but still contained a very large proportion of
ten *flour* and *turmeric*, with much less husk visible.

31*st*, 32*nd*, 33*rd*, and 34*th Samples.*—J. & J. Colman.

sample of each of the four qualities made was submitted to examination.
ere adulterated—with *wheaten flour*, coloured with *turmeric*, nearly in the
manner, and to the same extent, as in the former case.

35*th*, 36*th*, 37*th*, and 38*th Samples.*—Keens & Welch.

sample of each of the four qualities made was submitted to examination.
were adulterated—in the same manner, and as nearly as possible to the
e extent.

39*th* and 40*th Samples.*—Slee.

wo samples, "seconds" and "fine," examined. *Both adulterated*—in the
e manner, and to the same extent, as the corresponding samples of the
ufacturers previously named.

41*st Sample.*—Gaby & Wells.

ne sample about equal to "superfine" examined. *Adulterated*—with a very
e proportion of *wheaten flour*, highly coloured with *turmeric*, and not con-
ing very much husk.

42*nd Sample.*—Grimsdale & Co.

ne sample about equal to "superfine" examined. *Adulterated*—with a very
e proportion of *wheaten flour*, coloured with *turmeric*.

e have now shown—

st. That *genuine mustard*, whatever be the price paid for it, *is scarcely ever to be obtained.*

nd. That *the whole of the forty-two samples* submitted to examination *were adulterated.*

rd. That *the adulteration* practised, *in every case, was the same in kind, varying only in degree, and consisted in the admixture of genuine mustard with immense quantities of wheaten flour, highly coloured with turmeric.*

he mustards of the following manufacturers, Messrs. Finch & Co., J. &. J.
man, Keens & Welch, and Slee, were analysed for chromate of lead, but in no
ance was that poisonous mineral colouring matter discovered. The ash
ished by these mustards was found to vary from 4·0 to 5·8 per cent.

he practice of making inferior qualities of mustard, such as "seconds" and
e" mustard, is open to much objection, since it gives the unscrupulous
er the greatest scope for imposition. The poor man buys his mustard by
ounce, and for this he usually pays one penny, receiving so much "seconds,"
ne," or "superfine" mustard, as the case may be, according to the con-
nce of the vendor. As we have seen, "seconds" may be sold retail, and
a profit, at fivepence per pound; "fine" at eight pence, and "superfine"
even pence per pound. We are now, then, in a position to judge of the extent
hich the poor man is frequently defrauded in the article "mustard."

he following short correspondence will be read with interest as showing the
er of the microscope in the detection of adulteration.

THE ANALYTICAL SANITARY COMMISSION.

MUSTARD.

To the Editor of The Lancet.

r,—I noticed in a late number of The Lancet, a statement that genuine
ard was not to be obtained in London, and have found such to be the case.
ve been a manufacturer of mustard for twenty years, and during that time
frequently attempted to introduce it to the London trade, but could never
eed. The London mustard is principally made from the white mustard-
with the addition of the ingredients mentioned in your analysis. The de-
n of mustard I manufacture is from the *brown* seed (*Sinapis nigra*), of
I take the liberty of sending you a sample. You will find it quite free
e adulterations found in the London mustards. The reason why I could
et it into the London market is, the difference of colour—it being much

darker than that made from the white seed; and the brown seed being m dearer and less productive, I have to charge a higher price for it.

I am, Sir, yours obediently,
THOS. DEWA

Newcastle-on-Tyne, March 31. 1851.

⁂ Our correspondent is deceived; the article he has sent to us is n specimen of pure brown mustard, as it contains a small quantity of turmeric ED. L.

We cannot conclude the Report without calling attention to the follow communication. The testimony which it affords as to the extraordinary ac racy of the analytical examinations of our Commission is strikingly conclusi It now appears that the quantity of turmeric discovered consisted of only *part in* 448 of the quantity examined. The candid communication made by Dewar is highly creditable, and the new specimen he has forwarded shall subjected to an early scrutiny.—ED. L.

To the Editor of THE LANCET.

SIR,—In my letter to you of the 31st ult., respecting my mustard, I sta you would find it free from the adulterations found in the London mustar which I contend it is, except as you observe, "a small portion of turmeric," viz., *two ounces to fifty-six pounds* of seed, not for the purpose of gain or ad teration, but simply to enliven the colour, and make its appearance more ceptable. However, your remarks have determined me to relinquish that sm portion of extraneous matter, and depend solely on its original colour strength for its future success.

I am, Sir, yours obediently,
THOMAS DEW

Enclosed is a sample without colouring.
Newcastle-on-Tyne, April, 1851.

BREAD, AND ITS ADULTERATIONS.

BEFORE proceeding to ascertain the adulterations to which bread is subject, i proper to take into consideration a variety of particulars in relation to the c constituent of bread—viz., FLOUR.

As there are several kinds of bread, so will it be necessary to speak of se kinds of flour.

While there are important distinctions to be noticed between each of the employed in the manufacture of bread, there are also certain points of re blance.

Thus every flour used in the preparation of bread consists of *nitrogenised* *non-nitrogenised* elements or constituents: the former are vegetable fibrin, a men, caseine, &c., which have been named after the corresponding pro compounds existing in animal substances; the latter are starch, dextrine or g and sugar—products more particularly of the vegetable kingdom.

WHEAT-FLOUR.

There are several distinct species of wheat: that which is chiefly cultivat this country is the *Triticum vulgare;* of this there are two varieties—*T. a* or summer wheat; and *T. hybernum*, or winter wheat: the former is so the spring, and the latter in the autumn. Of these varieties, again, t several different modifications, into the description of which it is, howe necessary to enter on the present occasion.

Wheat-seeds or grains, as brought to the market, and as supplied to th are deprived of their *paleæ*, or husks, which, when coarsely ground, f articles known as bran and pollard.

The number of parts into which ground wheat is separated, and the of each yielded by given quantities, vary according to the characters of the wheat, and the processes adopted by different millers.

In wheats which are hard, the integuments separate with difficulty, and therefore the flour produced from these usually contains a greater proportion of adherent bran than do those flours procured from wheats which are soft, and which part with their epidermic coverings more readily.

According to Mr. Hard, a miller of Dartford, in Kent, the following are the products, with the quantities obtained, of one quarter, or eight bushels of ground wheat:—

"*Produce of One Quarter of Wheat, weighing* 504 *lbs.*

Flour - - - -	392 lbs.
Biscuit, or fine middlings - -	10 ,,
Toppings, or specks - - -	8 ,,
Best pollard, Turkey pollard, or twenty-penny	15 ,,
Fine pollard - - -	18 ,,
Bran and coarse pollard - -	50 ,,
Loss sustained by evaporation, and waste in grinding, dressing, &c. - - -	11 ,,
	504 lbs."

As it is frequently a matter of much importance to determine the composition of samples of wheat flour, we will now describe the various steps by which the analysis may be effected.

A weighed quantity of flour is to be made into a paste, and well kneaded, either on a sieve or in a piece of muslin, water being poured over it until it ceases to acquire a milky colour; the water carries away the starch, and dissolves out the albumen, sugar, gum, and salts, while the mass left on the filter consists of "crude gluten."

This *crude gluten* is itself, however, compounded of no less than four distinct substances—viz., gluten, vegetable fibrine, a very small quantity of mucine or caseine, and oil, in the following proportions:

Gluten - - - -	20
Vegetable fibrine - - -	72
Mucine (caseine?) - -	4
Oil - - - -	3·7
Starch (accidental) - -	a small quantity.
Crude gluten - -	99·7

Gluten.—This substance is obtained by boiling crude gluten in alcohol, which extracts the gluten, caseine or mucine, and the oil. The caseine is deposited on cooling, and after separation the residual liquid is evaporated until an adhesive mass is obtained, from which the oil is extracted by ether, and gluten alone remains.

Vegetable Fibrine.—This is insoluble in alcohol, and forms the chief part of the crude gluten; it is left nearly in a pure state after the action of that re-agent. It much resembles in its composition muscular fibre.

For the other constituents of wheaten flour we must search in the water, which has passed through the sieve.

Starch.—The starch, after remaining suspended for a time in the water, subsides, forming a precipitate; this may be readily obtained, and, after drying, its amount determined by weighing.

Vegetable Albumen.—This substance is procured by boiling the water, whereby the albumen is coagulated, and forms shreds or flakes, which rise to the surface, where they collect as a pellicle.

Caseine.—After the separation of the albumen, a little acetic acid is to be added, which throws down the caseine. The mucine (or caseine?) present in crude gluten is soluble in alcohol, from which, on cooling, it is thrown down in the form of white flocculi.

Oil.—The greater part of the oil is present in the outer part of the grain, from which it follows that the bran contains a larger proportion of oil th central part of the grain. It is best obtained by digesting whole or b wheat in ether. When wheat paste is washed in water, part of the oil away with it, and part remains in the crude gluten.

Sugar.—The sugar present in wheaten flour is of the kind denominate *cose;* its amount is determined by evaporating the water to dryness, an solving the sugar out of the residue by means of alcohol, which being in it evaporated, the sugar is deposited in a granular or semi-crystallised stat may be collected and weighed.

Gum.—The remaining part of the residue of the evaporated water con gum or dextrine, insoluble in alcohol; this also should be dried and weig

Water.—The quantity of water present in wheat, on an average, varie fifteen to seventeen per cent., and is greater in new than in old wheat, an this circumstance which makes the former of less value than the latter.

Mineral and Saline Constituents.—The more important of these are of potash and the alkaline and earthy phosphates, which are present in co able amount. For ordinary purposes it is not necessary to make so pre analysis as that indicated above; it will be sufficient to ascertain the am crude gluten present in a given quantity of flour.

To determine the quantity of this gluten, a little instrument has been in by Mr. Boland, termed an "*aleurometer.*"

Of this instrument the following description is given by Mr. Mitchell*

"It consists of a hollow copper cylinder, about six inches long, an three-quarters of an inch to an inch in diameter. It has two principal the one, about two inches long, is closed at one end, forming a kind capable of containing about 210 grains of fresh gluten; it screws into mainder of the cylinder. The cylinder being charged with gluten, is he about 420° in an oil-bath. The gluten by this treatment swells, and acc to its rise in the tube (which may be measured by a graduated stem) s quality. Good flours furnish a gluten which augments to four or five ti original bulk; but bad flours give a gluten which does not swell, b viscous and nearly fluid, adhering to the sides of the tube, and giving o sionally a disagreeable odour, whilst that of good flour merely sugge smell of hot bread."

The proceeding adopted by the corn-chandler and the baker for the d nation of the quality of wheaten flour is still more simple.

A small quantity (a few grains is sufficient) is made into a paste with and its quality judged of by the tenacity of the dough, the length to may be drawn into a thread, or the extent to which it may be spread ou thin sheet.

The following analyses by Dumas show the composition of 100 parts o flour:—

WHEAT FLOUR.		ODESSA FLOUR (Flinty).		ODESSA FLOUR (	
Water -	- 10·00	Water -	- 12·00	Water -	
Gluten -	- 10·96	Gluten -	- 14·55	Gluten -	
Starch -	- 71·49	Starch -	- 56·50	Starch -	
Sugar -	- 4·72	Sugar -	- 8·48	Sugar -	
Dextrine -	- 3·32	Dextrine -	- 4·90	Dextrine -	
	100·49	Bran -	- 2·30	Bran -	
			98·73		

Wheaten flour contains a greater amount of proteine or nitrogenis pounds—that is, of blood and flesh making principles—than any other d tion of farina.

Characters of the Starch of Wheat.

Starch, almost constantly occurs, in the vegetable kingdom, in the organised corpuscles: the characters of these frequently vary greatly in d plants; these differences being often so considerable as, by the aid afford information of a highly valuable character, and to allow distinguishing many different farinas from each other.

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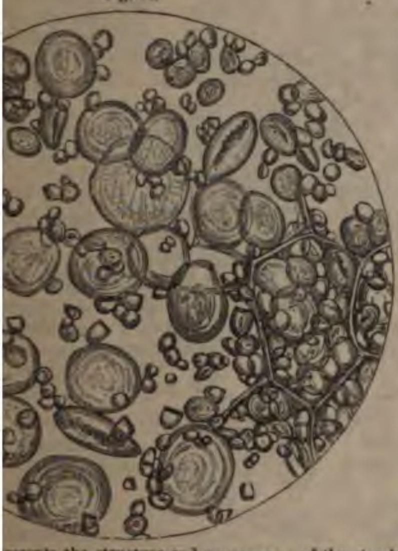
* Treatise on the Falsification of Food, p. 48.

an object-glass magnifying 420 diameters linear, wheat-starch is isist of definite grains or particles; many of these are very small, onsiderable dimensions, while there are but few of intermediate ll grains are chiefly round, rarely oval, or muller-shaped, and for provided with a central spot or hilum: the larger granules form tened discs, with thin edges. Neither hilum nor concentric rings perceptible on the larger discs, although in some few a central be seen as well as indistinct annuli. Occasionally some of the are more or less misshapen, and present the appearance of a rrow, which has been erroneously described as a hilum: this appearance is, however, deceptive; it is really occasioned by the partial folding or curling of the grain on itself, whereby a central depression is produced, the corpuscle at the same time being viewed obliquely. We have frequently seen grains which when stationary presented a round and disc-like appearance, but which, in rolling over and presenting the edges to view, exhibited the longitudinal furrow described, an observation which clearly proves its nature. A few granules attain a very considerable size; these are less regularly circular, and being much flattened, reflect but little shadow; sometimes their edges are with radiating lines. Many of the above described particulars, racters of the cellulose, are well exhibited in the figure.

Fig. 44.



resents the structure and appearances of the starch FLOUR, as also the characters of the *cellulose*. Drawn Lucida, and magnified 420 diameters.

BARLEY-FLOUR.

veral distinct species of barley, that, however, which is commonly is country is the *Hordeum distichon*, or two-eared barley.

in commerce the seeds or grains are usually enclosed in the *paleæ* uded of these they form "*Scotch* or *pot barley*," when rounded "*pearl barley*," and this again reduced to powder is called ."

of barley-flour must be conducted very much in the same manner t-flour.

ion of azotised compounds in barley is less than in wheat-flour; rticularly in crude gluten, so that barley-paste may be nearly all water.

uid obtained by washing barley-paste, deposits, as well as the ie matter supposed to be *insoluble caseine:* if this be digested with nmonia it is dissolved, but is again thrown down on the addition the liquid which has deposited the starch and insoluble caseine lution a small quantity of albumen and some soluble caseine.

Barley-flour is less nutritive than wheat-flour; its starch corpuscles are le soluble, and therefore resist more the action of the gastric juice; the husk "i slightly acrid;" and it is somewhat laxative.

Characters of the Starch of Barley.

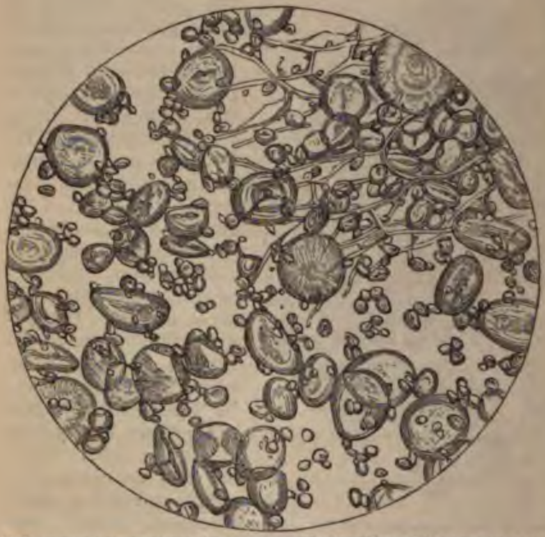
The starch-granules of barley resemble very closely in form and structur those of wheat, so that the description already given applies to some extent t the starch of barley.

Barley-starch consists of small and large grains, with but few of intermediat size; the former, it is to be particularly observed, are three or four times smaller than the corresponding grains of wheat-starch; and of the larger grains many are distinctly ringed, while a much greater proportion of them presents the longitudinal furrow, the nature of which has already been described. These characters are sufficiently well marked to allow of the discrimination by the microscopist of wheat and barley-flour, or starch.

Considerable difference is observed between wheat and barley-flour in the action upon them of boiling water and some other reagents: thus, after prolonged boiling, in the case of barley-flour, a substance remains undissolved, which has been denominated "*hordeine*," whereas wheat-flour treated in the same manner is nearly all dissolved.

By the above characters, and particularly by the minuteness of the small grains, barley-starch or meal may be readily and satisfactorily discriminated.

Fig. 45.



This engraving represents the structure and characters of BARLEY-STARCH, together with the *cellulose*. Drawn with the Camera Lucida, and magnified 140 diameters.

RYE-FLOUR.

The grass from which rye is obtained is the *Secale cereale*.

The seeds or grains resemble those of wheat, but are smaller, and as met with in the market, devoid of husk.

The analysis of rye-flour must be conducted much in the same manner as that of wheat and barley-flour.

Rye-flour is rather less rich in nitrogenised products than wheat-flour, but it contains more sugar; its paste, when repeatedly washed in water, breaks up, and becomes diffused throughout the liquid, the bran only being left behind; the milky liquid, after having deposited the starch, and after the separation of the albumen, is to be evaporated, when the residue will consist of sugar, oil, and the so-called "*soluble gluten*," which may be dissolved out by means of alcohol.

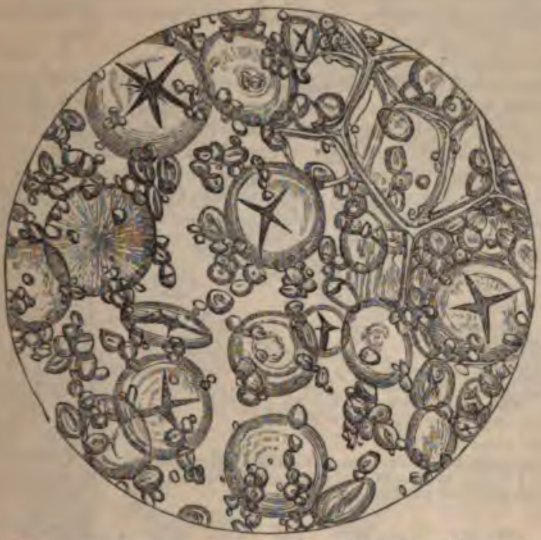
Rye-flour is said to be somewhat laxative.

The roasted grains are not unfrequently employed in the adulteration of coffee.

Characters of the Starch-Corpuscles of Rye.

The starch-granules of rye-flour bear a general resemblance in form and siz to those of wheat: there are these remarkable and satisfactory differences, how ever—viz., that the lesser grains are decidedly smaller than the corresponding grains of wheat, and that many of the larger granules of rye-starch are furnished with a three or four-rayed hilum.

Fig. 46.



This engraving represents the structure and characters of the starch-granules of RYE-FLOUR. Drawn with the Camera Lucida, and magnified 420 diameters.

OAT-FLOUR.

There are several distinct species of oats, that, however, which is chiefly cultivated in this country is *Avena sativa.*

The oat grains or seeds are usually enclosed in their husks; when deprived of these they form what are known as "*groats*," and these crushed constitute "*Embden groats.*"

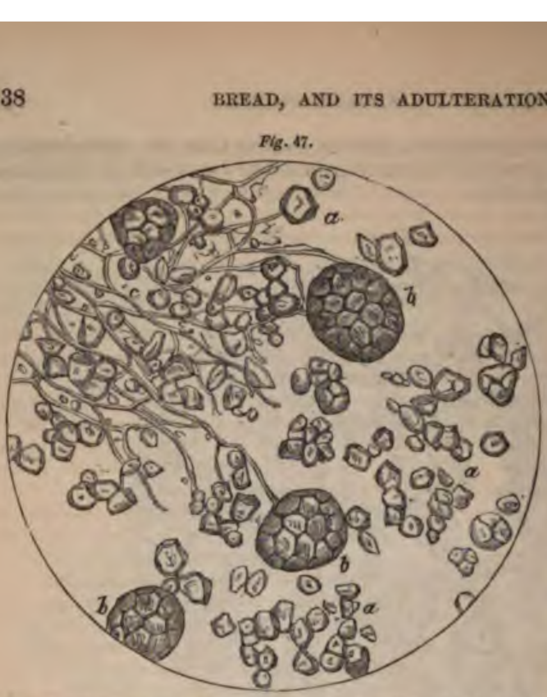
Rye-flour or meal does not form a dough or paste like wheat-flour; notwithstanding which, however, it contains a large amount of nitrogenised matter; this exists principally in the form of "*avenin*," a substance analogous to soluble caseine, and obtained in the same manner, by the addition of acetic acid.

"Oatmeal," Pereira remarks, "is an important and valuable article of food. With the exception of maize or Indian corn it is richer in oily or fatty matter than any other of the cultivated cereal grains; and its proportion of protein compounds exceeds that of the finest English wheaten flour; so that both with respect to its heat and fat-making, and its flesh and blood-making principles, it holds a high rank."

Characters of the Starch-Corpuscles of the Oat.

The starch-granules of the oat present well-marked structural characteristics. They are smaller in size than those of wheat, varying but little in dimensions, are polygonal in figure, without either visible concentric rings or hili, but with central depressions and thickened edges. The great peculiarity of oat-starch, however, is, that many of the grains cohere together, forming bodies of a rounded or oval figure, and presenting a reticulated surface, indicative of their compound structure. These bodies escape readily from the cellulose, and, when oat-flour is diffused through water, may frequently be seen floating about freely in the liquid. A second peculiarity is, that, unlike the other cereal starches, the grains of oat-starch, when viewed with polarised light, do not exhibit the usual crosses. The above particulars are well exhibited in the accompanying engraving.

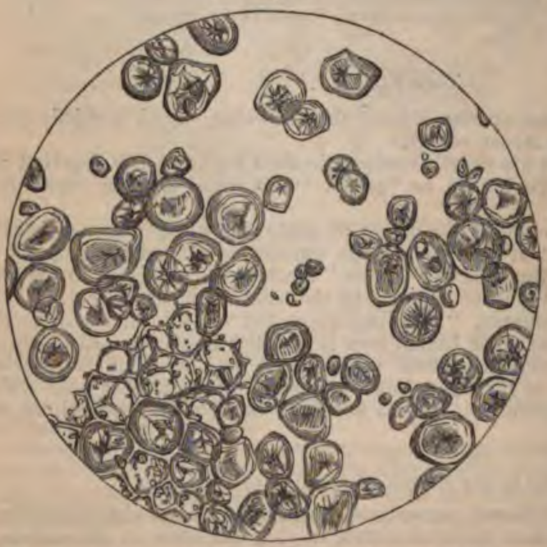
Fig. 47.



This engraving represents the structure and characters of the starch-corpuscles of OAT-FLOUR, as also of the *cellulose*. Drawn with the Camera Lucida and magnified 420 diameters.

A figure of oat-starch is given in the new edition of Pereira's "Materia Medica." In this the larger grains are made fully equal in size to those of wheat-starch; whereas they are really several times smaller, as represented in our engraving. This error has probably arisen from the artist having mistaken the compound bodies in question for single granules. The same error pervades some of the measurements given.

Fig. 48.



This engraving represents the structure and characters of the starch-granules of INDIAN-CORN FLOUR, including the *cellulose*. Drawn with the Camera Lucida, and magnified 420 diameters.

INDIAN-CORN FLOUR.

Zea Mays, or Indian corn, is met with in the state of flour, in the shops, under the name of "*Polenta;*" it enters into the dietary of many of our public institutions and charities.

The amount of azotised constituents is less in maize than wheat; it contains, however, a larger quantity of oil, which accounts for its fattening properties.

In those unaccustomed to its use, maize is considered to excite and to keep up a tendency to diarrhœa.

Characters of the Starch-corpuscles of Indian Corn.

The starch-corpuscles of Indian corn bear considerable resemblance to those of the oat; like them, they are polygonal in outline, and present well-marked central depressions, as well as occasionally a divided and radiate hilum; they differ, however, in their *much larger* size, in not forming compound bodies, and in presenting under

cope well-defined crosses. The central depression appears to be a
in common between nearly all the starch-granules of the cereal
This depression, combined with the disc-like form of the grains, gives
neral resemblance to the blood-discs of the mammalia. In those in-
which the grains, as in wheat and barley, are curved upon themselves,
sion exists of course only on one side of the disc.

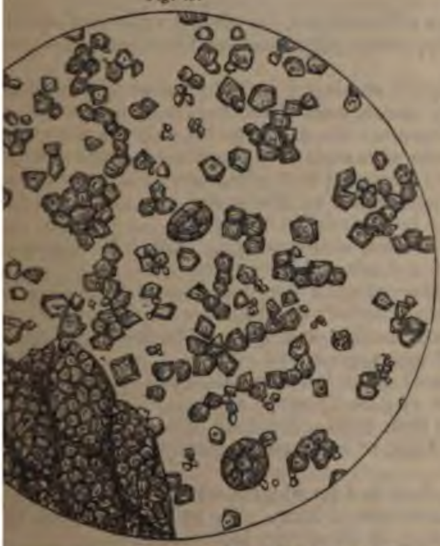
Rice-Flour.

ds of rice, *Oryza sativa*, contain a much less proportion of nitro-
mpounds than the other cereal grains, and particularly wheat— viz.,
n per cent.: the quantity of fatty matter is also less.
stance obtained from rice, termed gluten, is precipitable by acetic acid,
a creamy consistence, an agreeable smell, and a bland taste."
fference of opinion has prevailed in reference to the value of rice as
of diet, some persons placing it very high. Analysis, however, clearly
t it is the least nutritious of the cereal grasses.

This difference of opinion has probably arisen from the fact, that rice is seldom eaten by itself, but is partaken of usually with milk, butter, or sugar, the nutritious properties of which substances have been attributed to the rice itself.

Rice is used as an article of diet in a variety of forms.

Fig. 49.



g represents the starch-corpuscles of Rice-flour. Drawn
the Camera Lucida, and magnified 420 diameters.

Characters of the Starch-corpuscles of Rice.

The starch-corpuscles of rice are small, and for the most part of an angular form, with well-marked central depressions and raised edges; they resemble closely the starch-grains of the oat in their polygonal shape and the occasional occurrence of the compound structures or bodies, but differ in being much smaller.

ON THE ADULTERATIONS OF FLOUR.

first cite the statements which have hitherto been advanced in refer-
e adulteration of flour by those English authors who have written on
t of the sophistication of food, and then proceed to ascertain how
tatements are applicable at the present time.
the earliest great authority on the adulteration of food, although he
ed a chapter to bread and its adulterations, does not appear to have
any particular examinations or analyses of flour.
, in his Dictionary, under the head "flour of wheat," writes, —
rst method to detect the adulterations of flour is by specific gravity.
lour be added, which is frequently done in France, since a vessel which
ne pound of wheat-flour, will contain one pound and a half of the fecula,

the proportion of this adulteration may be easily estimated. If gypsum or ground bones be mixed with the flour, they will not only increase its density still more; but they will remain after burning away the meal.

"The second method is by ascertaining the quantity of gluten which the suspected sample will afford, by the process prescribed under the article Bread. The two following chemical criteria may also be employed:—

"1st. Nitric acid has the property of colouring wheat-flour of a fine orange yellow, whereas it affects the colour neither of fecula nor starch.

"2nd. Pure muriatic acid colours good wheat flour of a deep violet, but dissolves fecula or starch, and forms with it a light, colourless, viscid fluid, decomposable by alkalis. It may also be observed, that as fecula absorbs less water than flour, this affords a ready means of detection.

"The adulteration with bean or pea flour may be detected by pouring boiling water upon it, which develops the peculiar smell of these two substances."

Mitchell gives a whole section of his work to the consideration of flour and its adulterations. The substances employed, he writes, in the adulteration of flour, are the following:—"potato-starch (much employed in France), bean, pea, and rye flour, chalk, bone-earth (burnt bones), powdered flints, and plaster of Paris."

On the detection of these adulterations, he offers a variety of observations.

According to Normandy, whose Handbook of Chemical Analyses was published in June, 1850,

"The substances principally employed for the purpose of adulterating wheat-flour, are *potato* or *fecula starch*, *bean-flour*, *Indian-corn flour*, *rye* and *rice flour*, which alimentary substances are objectionable only when the flour containing them, or the bread made with such flour, is sold as genuine wheat-flour or bread; but besides these so far venial additions, flour is sometimes sophisticated by *alum*, *chalk*, *bone-dust* and *plaster of Paris*, and it is more especially against these that the rigour of the law should be enforced."

"Wheat-flour," states Pereira, also writing in 1850, "is subject to adulteration with various vegetable and mineral substances.

"Among vegetable substances used for the purpose of adulterating wheat-flour, the following have been named:—potato-starch, the meal of other cereal grains (viz., of maize, rice, barley, and rye), of buck-wheat, and of certain leguminous seeds (viz., of beans, peas, and vetch).

"The numerous substances which have been used to adulterate wheat-flour are chiefly chalk and sulphate of lime (plaster of Paris). White clay and bone-ashes are also said to have been used. Sulphate of copper and alum are sometimes added to bad wheat-flour, to improve its quality, and render it more fitted for making bread."

We have thus placed before us a formidable array of articles and substances said to be used in the adulteration of flour. We will now proceed to point out the manner in which the chief of these may be detected.

On the Detection of the Organic Adulterations of Flour.

On the Detection of Potato-flour.—The starch-granules of the potato have already been described as well as figured in the Report on Arrow-root; they are distinguished from those of wheat-flour described and represented in this Report (*fig.* 44.) by their larger size, ovate form, and the numerous well-marked concentric rings visible on the surface.

For the detection of this adulteration, no other means is requisite than the microscope, and none other is equally simple or certain. It may be mentioned, however, that other methods have been pointed out for the detection of potato-flour.

Thus, a vessel which holds exactly one pound of wheat-flour will contain nearly a pound and a half of potato-starch, and thus by weight and measurement alone the amount of adulteration may to a certain extent be estimated.

The following method, recommended by M. Gay Lussac, is described by Mitchell:—

"Take of the suspected flour about 350 grains, the same quantity of fine sand and 2½ fluid ounces of water.

ate, in a mortar, the sand and flour, for about five minutes, then gra-
a little of the water, so as to dilute it evenly, and form a homogeneous
ow the whole upon a filter, and take about one ounce of the clear
ce it in a test glass, and add the same quantity of an aqueous solution
(prepared at the same time by adding a small quantity of iodine to
r).

omparative experiment be made on pure flour, and a flour adulterated
ten per cent. of starch, it will be seen that, firstly, the water filtered
pure flour will have a rose tint, approaching to a red; secondly, the
roceeding from the adulterated flour will have a deep violent tint,
disappear much more slowly than the rose tinge of the pure flour.

se liquids be examined from time to time, it will be seen, that the tint
he water from the pure flour becomes lighter at first at the bottom of
, and disappears altogether in eight or ten minutes; and a similar
oduced by the tinge of the water from the adulterated flour, but it dis-
ss rapidly, and the violet colour remains a long time at the surface of
and is, so to speak, divided into two distinct portions, the one white
her coloured."

ethod is needlessly tedious, and its indications not very satisfactory.
ation with sand ruptures many of the starch-granules of the potato, on
their large size, and thus they are rendered more susceptible of the
odine.

Detection of Bean, Pea, or other Flour of Leguminous Seeds.— The
nules of the majority of the *Leguminosæ* present exceedingly well-
istinctive characters. These have been already partially described,
future Report we shall probably give engravings illustrative of the
nd characters of bean, pea flour, &c.

rch-granules of the bean, pea, &c. are either oval or reniform, with a
us longitudinal furrow.

roscope, therefore, here also affords the readiest and most satisfac-
s for the detection of these adulterations.

ever, other means have been pointed out, it is proper to describe these

l states that the adulteration of wheat-flour with beans and peas "may
d by the peculiar smell evolved when a small quantity of boiling water
upon the flour to be examined. If pea-flour be present, the odour of
be evolved; if bean-flour, that of beans. Bean-flour also communi-
e-coloured tinge to bread adulterated with it."

leguminous seeds contain, as is well known, in considerable quantity,
e called "legumine," which somewhat resembles caseine, being, like
table by acetic acid. The suspected flour, therefore, should be di-
some hours in water, which should be filtered, and then tested with
: if a copious precipitate falls, it becomes probable that it is really
d with bean-flour. This evidence is not conclusive, however, from the
nce that wheat itself contains caseine, precipitable by the same re-

method of distinguishing the flour of two leguminous seeds, the vetch
ommon tick-bean, has been pointed out by Donné. "It consists,"
ra, "in exposing the suspected flour to the successive action of the
nitric acid and ammonia. Wheat-flour, when thus treated, becomes
t the meals of the leguminous seeds just referred to become red; and
at-flour, adulterated with either of them, becomes more or less spotted
ccording to the proportion of the leguminous meal present."

nethods are for the most part superseded by the microscope, the indi-
orded by which are so conclusive.

Detection of Maize-flour.— The structure and characters of maize-
already been described and figured (see *fig.* 48.); they are exceed-
ite and very distinct from those of wheat-flour, so that there could be
y whatever in distinguishing Indian corn when admixed with wheat-
by the microscope, which instrument, indeed, affords, in many cases,
vailable means of discrimination.

Detection of Rye-flour.— Rye-flour, when admixed with any other cereal farina, may likewise be readily detected by means of the structural peculiarities revealed by the microscope. (See *fig.* 46.)

On the Detection of Oat-flour. — The structural peculiarities of oat-flour are very great, and there is no difficulty whatever in ascertaining the admixture of oat-flour with any other farina. (*Fig.* 47.) But for the application of the microscope to investigations of this nature, the greater number of the adulterations to which the food we consume is liable, would entirely escape detection. Important as chemistry is, very many of these sophistications elude the detective powers of that science.

On the Detection of Barley-flour. — The starch-corpuscles of barley resemble very closely those of wheat-flour; nevertheless, it may be readily discriminated by means of the microscope. (*Fig.* 45.)

On the Detection of Rice-flour. — The characters of rice-flour, as we have seen, are so peculiar, that this farina also may be readily distinguished from all others with which it is admixed. The starch-corpuscles are very small, angular in form, and frequently cohere, forming little masses.

ON THE DETECTION OF THE INORGANIC ADULTERATIONS OF FLOUR.

On the Detection of Carbonate of Lime or Chalk. — In every case in which mineral substances have been admixed with flour, for the purpose of adulteration, the fact of such admixture may be clearly ascertained by means of the microscope; for, mixed up with the starch-corpuscles, there will always be noticed in such cases a certain proportion of unorganised matter in the form of irregular grains and particles; thus, with but little loss of time, the observer is enabled to ascertain, out of a number of samples, those which are thus adulterated, and is saved all the trouble and expense attending the performance of a number of merely experimental and chemical analyses.

The means to be pursued for the detection of chalk are of an exceedingly simple character. A teaspoonful of flour should be placed in a wine-glass containing a little water; a few drops of hydrochloric acid are then to be added, when, if chalk be present, a brisk effervescence, arising from the escape of carbonic acid, will ensue.

The lime may be detected by means of a solution of oxalate of ammonia, when an insoluble white powder, the oxalate of lime, will be found.

On Bone-dust and the Detection of Phosphate of Lime. — For the detection of bone-dust or flour, a knowledge of the normal structure of bone and a microscope are alone necessary. In a sample of flour adulterated with bone-dust, and examined with that instrument, particles and fragments will be visible, in some of which, bone-cells and other structures characteristic of bone will be visible.

This adulteration, it has been alleged, was formerly one which was very frequently practised; of late, however, it is not often had recourse to, partly in consequence of the diminished price of flour, and the increased value of bone-dust as a manure.

The means hitherto adopted for the discovery of bone-dust in flour have been directed principally to the detection of the phosphate of lime, which enters so largely into the composition of bone.

This is best effected by burning the suspected flour in a crucible, and weighing the ash left after incineration; if it form considerably more than one and a half per cent. of the flour so calcined, then it is certain that it is adulterated with some inorganic substance.

If a portion of the ash dissolved in water give with nitrate of silver an abundant precipitate, and if a considerable quantity of lime be detected by means of oxalate of ammonia, the foreign substance is proved to consist of phosphate of lime.

On the Detection of Sulphate of Lime or Plaster of Paris. — A given quantity of the suspected flour should be incinerated in a crucible, and the ash be weighed; if this be in excess, we must employ the tests proper for sulphuric acid and lime — viz., chloride of barium, or nitrate of baryta, and oxalate of ammonia.

gives the following directions for the discovery of plaster of Paris in

quantity of the flour, act on in the same manner as in the estimation
nd pour the liquid containing the starch (as well as the plaster) into
ass. In course of time all will be deposited, leaving a clear liquid;
ter, being heavier than the starch, will be deposited first. When the
s complete, pour off the water, and place the glass with the deposited
plaster in a warm place. The precipitate will dry, and in a short
of the glass; all the plaster will be found at the point of the cone,
be separated, and boiled in a solution of carbonate of soda. During
n, the sulphate of lime present will be decomposed, with the forma-
soluble carbonate of lime and a soluble sulphate of soda.

hole be now thrown on a filter, and solution of chloride of barium
e filtered solution, a white precipitate of sulphate of barytes will fall
f Paris be present), which is insoluble in excess of nitric acid. Wash
e residue of carbonate of lime on the filter, and dissolve in a little
an effervescence will take place, and lime may be detected in the
means of oxalate of ammonia, which will produce a white precipi-
in excess of nitric acid."

ddition of White Clay.—If it be suspected that the flour contain
ce, a given quantity of it should be incinerated, and the ash weighed
If the greater part of this ash be soluble in a solution of potash, and
recipitate fall on the addition of ammonia, it consists of the earth in
umina or the oxide of aluminium.

s for the detection of *alum* and *copper*, found chiefly in the manu-
icle bread, but sometimes also in the flour, will be given hereafter.

ow proceed to ascertain, by a number of examinations and analyses
samples of flour, the extent to which this article is adulterated at the
e.

the Microscopical and Chemical Analyses of Forty-four
of Wheaten-Flour, purchased at the Establishments of
nt Corn-chandlers and Bakers resident in the Metropolis.

numerous statements quoted in the first part of this Report, in re-
he adulteration of flour, it will be expected that the disclosures which
make will not be less startling than those already made known in
other articles of consumption. This expectation, however, we are
nounce, will not be realised.

r samples of wheat-flour have been submitted to analysis, including
oth *French* and *American* flour.

ples were first subjected to *microscopical examination.*

tance was any other farina than wheat-flour observed, nor was the
foreign matters of any kind detected.

e next subjected to *chemical examination.*

of each was tested for chalk or carbonate of lime: *in none was this*
etected.

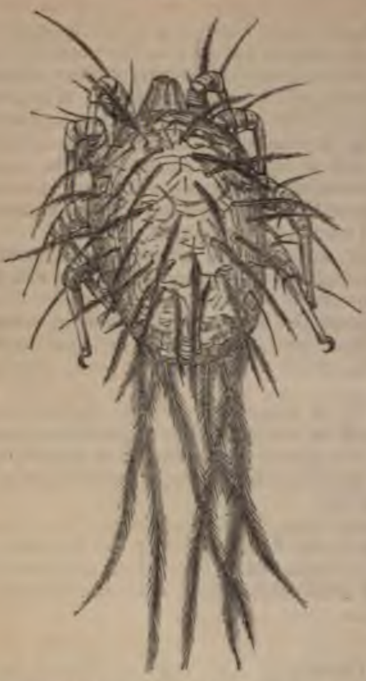
portion of each sample was next incinerated: *in no case was there an*
h, and consequently *none of the samples were adulterated with bone-*
clay, sulphate of lime, or gypsum.

ly of the samples was anything unusual observed, and this contained
ntity of the *Uredo Caries*, a fungus to be hereafter described.

satisfactory results, we are, to some extent, no doubt, indebted to
which, by reducing the price of flour, has removed much of the in-
o its adulteration. We would not, however, attribute this freedom
ration to this cause only, as were millers and corn-dealers to be
less and dishonest enough to put in practice so gross a fraud, means
ting for the adulteration of flour to such an extent as would reduce
the article on each sack by several shillings.

s, therefore, that millers and corn-dealers are somewhat maligned,
a rule at least, the housekeeper may use the flour she purchases
uddings or bread, without any great misgivings as to its genineness.

Fig. 50.



The Acarus farinæ, or *meal-mite*. Drawn with the Camera Lucida, and magnified 220 diameters.

We should state, however,
various samples of flour were n
for alum.

It now only remains to obse
the samples were procured f
quarters of the metropolis—
chapel, Lambeth, Clare-market
minster, Somers-town, Padd
&c.

The Acarus farinæ.

In our Report on Sugar, i
we gave a description and fi
the *Acarus sacchari*, we spoke
Acarus farinæ, or *meal-mite*.

This mite is of occasional, i
may be said to be even of ra
currence in flour, and it is never
unless this has become damage
flour, therefore, containing the
in question is in a state unfit f
sumption.

We believe that it is found
frequently in the flour of the
nosæ than that of the *Gramine*
of between forty and fifty sam
wheat-flour submitted to micr
examination, we did not onc
with it.

This acarus differs consider
structure from the sugar-mit
particularly in its pennate setæ

The Bearded or Poisonous Darnel.

The poisonous grass, *Lolium temulentum* or *darnel*, is by no means of
mon occurrence, and numerous accidents have from time to time occur
consequence of its becoming mixed up either with the flour of wheat, o
other cereal farina.

The effects of darnel on man are thus described by Pereira :—

"The ill effects of the seeds of bearded darnel on man were known
ancient Greeks and Romans. The symptoms which they produce are t
those indicating gastro-intestinal irritation,—such as vomiting and coli
those which arise from disorder of the cerebro-spinal system,—such as
ache, giddiness, languor, ringing in the ears, confusion of sight, dilated
delirium, heaviness, somnolency, trembling, convulsions, and paralysis.
seeds therefore appear to be acro-narcotic poisons. According to Seeg
of the most certain signs of poisoning by them is trembling of the whol
Both Burghard and Schober (quoted by Wibmer) mention death as hav
sulted from their use. In Cordier's cases their ill effects were directly
tained by experiments made upon himself; but in most other cases the
the result of accidental poisoning. In general they have arisen from th
mixture of bearded darnel-seeds with other cereal grains. In a pr
Cologne, sixty persons suffered from the use of a bread-meal, contai
drachm and a half of lolium temulentum, in six ounces of meal."

As the chemical tests for darnel when mixed with flour are not very s
tory or decisive, we have submitted the starch-corpuscles of the seeds to
scopical examination, and find them to be so different from those of w
rye, that when admixed with these they may be readily detected.

The majority of the starch-corpuscles resemble very closely those of ric

rm, but intermixed with the ordinary granules are others of peculiar
of which it is difficult to convey an accurate notion; they are, however,
hat semilunar in outline.

ON THE DISEASES OF THE CEREAL GRASSES.

grains or ears of nearly all the grasses are subject to several well-marked
es, resulting from attacks of parasitic fungi, animalculæ, and insects.

e liability of the seeds of grasses to parasitic infection is explained by the
amount of nitrogenised matter contained in them, and the softness of their
re.

ne of these diseases are of the greatest importance to the agriculturist, and
ot without interest to the public: to the scientific inquirer they offer much
r for observation and reflection.

the majority of the diseases to which corn is subject a clear and succinct
nt has been given by Professor Henslow*: from this we shall have here-
to borrow largely.

ON THE ERGOT MOULD OR FUNGUS.

s production has excited much interest and discussion.

e of the best memoirs written upon the *Ergot fungus* is that by the late
Edwin Quekett, published in the *Transactions* of the Linnæan Society.
ugh the sporules had been previously recognised by Phillipar, Phœbus, and
, Mr. Quekett was the first to witness their germination into threads or
nts, as also to show that they were capable of infecting sound grain.

s fungus is particularly prone to attack the seeds of rye, the disease pro-
by it in these being called *spur* or *ergot*. It does not confine its ravages,
ver, to that one grass, but has been observed to attack a variety of different
s, and amongst the rest the ears of wheat.

ins of rye infested with this fungus increase to several times their original
they are white and spongy in the interior, and black, or purplish-black, on
cterior.

e internal white part, or *body* of the grain, exhibits little or no remains of
iginal structure; the integuments have become destroyed, as also the
ose, together with the contained starch-corpuscles. In place of these
al structures we observe a tissue formed of very minute and angular
—many times smaller than the original starch-cells; the cavities of these
ccupied with one, two, and in some few cases even three little sporules

ether this tissue belongs to the fungus, or is to be regarded as a portion of
heat itself altered by disease, does not appear to have been determined.

e consider that this tissue is part of the fungus itself, and that the hexagonal
are formed by the cohesion of the more internal of the branched and
lated threads or filaments of the fungus.

is view acquires much confirmation from an examination of the central part
affected grains.

e centres of the ergotised grains are frequently constituted of a spongy
ance, which, examined under the microscope, is seen to consist of numerous
hed threads, the cells forming which frequently cohere into a tissue, not
that already described, situated more externally; the cavities of these cells
nclude spherules of oil.

e external or *coloured portion* of the grain is of perceptible thickness, but
much less of its bulk than the internal or colourless part; to the eye it
rs black, or dark purple, but under the microscope, light purple.

onsists of straight filaments, of considerable thickness, frequently cohering,
ly undivided, but sometimes branched, and for the most part, especially
heir terminations, provided with distinct septa.

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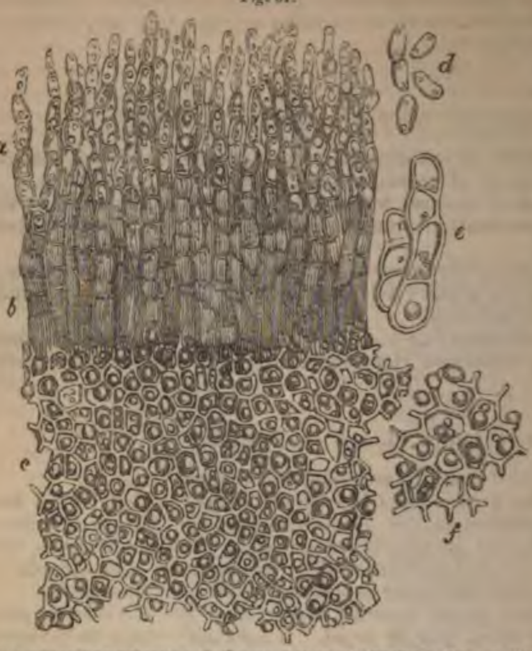
* Journal of the Royal Agricultural Society, 1841.

Fig. 51.



This engraving represents a transverse section of ERGOT OF RYE. *a.* Terminal colourless filaments bearing the spores, which are seen on the extremities. *b.* The coloured threads which constitute the black or purple portion of the grain. *c.* The cells, with the contained spherules of oil, which form the body or colourless part of the grain, magnified 420 diameters. *d, e, f,* represent minute portions of the same structures, more highly magnified—viz., 670 diameters.

In a figure by Corda, these filaments are represented as simple tubes without septa, a representation which is clearly incorrect.

These coloured filaments, near their distal extremities, diminish in diameter, and terminate in short, colourless, sometimes branched threads also provided with septa, and supporting rows of strings of minute oval corpuscles, the width of each of which is usually much less than that of the coloured filaments.

The colourless threads bearing the sporules constitute the third or *reproductive portion* of the fungus.

The sporules are colourless; separate easily from each other, and form the "*bloom*" of the ergotised grain.

The above structural particulars are well exhibited in the above engraving.

Numerous and well attested instances are on record of dangerous and even fatal effects resulting from the use of bread containing ergot.

"Different parts of the continent—*e. g.*, France (especially in the district of Sologne), Silesia, Russia, Bohemia, Saxony, Denmark, Switzerland, and Sweden, have been, at various periods, visited with a dangerous epidemic (known by the names above mentioned), which affected at the same time whole districts of country, attacking persons of both sexes and of all ages. So long back as 1597 (Tissot), the use of ergotised rye was thought to be the cause of it. Various circumstances have appeared to prove the correctness of this opinion, which has been further confirmed by the effects of ergot on animals, as well as by the occurrence of a disease similar to, if not identical with, ergotism, in consequence of the use of damaged wheat."—*Pereira.*

Two kinds of ergotism have been described, convulsive and gangrenous. In *convulsive ergotism* the symptoms are, weariness, vertigo, muscular contractions, itching or formication, "dimness of sight, loss of sensibility, voracious appetite, yellow countenance, and convulsions followed by death." In *gangrenous ergotism* there is also formication, or a feeling as if insects were creeping over the surface; voracious appetite, coldness and insensibility of the limbs, followed by slow and insidious gangrene.

ON THE BUNT, SMUT BOLLS, OR PEPPER BRAND.

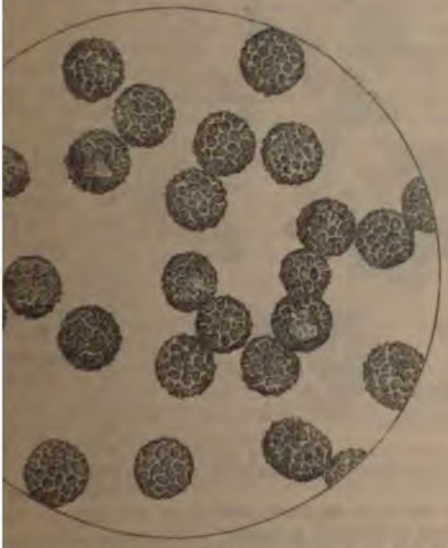
(*Uredo caries*, Dec.; *Uredo fœtida*, Bauer.)

"The fungus which occasions this well-known and much-dreaded dise hitherto been met with only in the grains of wheat. Its presence is by the peculiarly disgusting odour of the infected ear. It may be the young seed, even in the very earliest stages, and in the flower- hen fully ripe, it most frequently occupies the whole interior of the rithout bursting the skin, so that the wheat-seed retains very nearly ze and shape that it would have assumed had it been perfectly sound. ined under the microscope, the bunt-fungus is seen to consist of vast extremely minute globules, of a dark colour, and which are at first a mass of matted thread-like matter, analogous to what is termed the ushrooms, and other agarics; and which in those plants spreads d, and frequently occasions the remarkable appearances called fairy not easy to see this spawn of the bunt-fungus, but the little dark lled spores may be readily detected. They may be considered o the seed-vessels of flowering plants, and each of them contains a ost inconceivably minute sporules, by means of which the plant is

productive powers of fungi are quite beyond our comprehension. f our greatest authorities, has calculated that a particular fungus 10,000,000 sporudia. M. Bauer has accurately measured the spores nt species, and finds their diameter is not more than $\frac{1}{1600}$ of an inch. rain of wheat (estimated at less than the $\frac{1}{1000}$ of a cubic inch) efore contain more than 4,000,000 such spores. But it is hardly conjecture how many sporules each spore contains, since they are tinguishable under very high powers of the microscope; and then as a faint cloud or vapour, whilst they are escaping from the ores.

his disease prevails, it greatly deteriorates the value of the sample; s disgusting odour to the flour, it makes it less fit for bread; but I understand that ready purchasers are to be found among the vendors of gingerbread, who have discovered that the treacle, and whatever else they mix up with it, effectually disguises the odour of the fungus: if this in itself is really innocuous, there can be no objection to such a mode of employing the tainted flour; but some are of opinion that it is, to a certain extent, deleterious. Although the bunt-fungus confines its attacks to the young seed, it seems to be a condition essential to its propagation, that it should be introduced into the plant during the early stages of its growth, and that its sporules are most rbed by the root during the germination of the seed from which the prung. It has been clearly proved that wheat-plants may be easily d the disease thus propagated, by simply rubbing the seeds before wn with the black powder, or spores of the fungus. It is also as ertained, that if seeds thus tainted be thoroughly cleansed, the d from them will not be affected. This fact is now so well

Fig. 52.



represents the spores of UREDO CARIES, magnified 420 Drawing made from a preparation belonging to the late Dr.

established, that the practice of washing or steeping seed-wheat in
solutions almost universally prevails."—*Prof. Henslow.*

To the above clear and interesting description we have but little to
cept that the surface of the spores usually presents a reticulated app
as shown in the figure, indicative probably of a structure compounded of
lesser cells, which form, by cohesion, the external membrane of the spo
some few of the spores the reticulation is less perfectly seen.

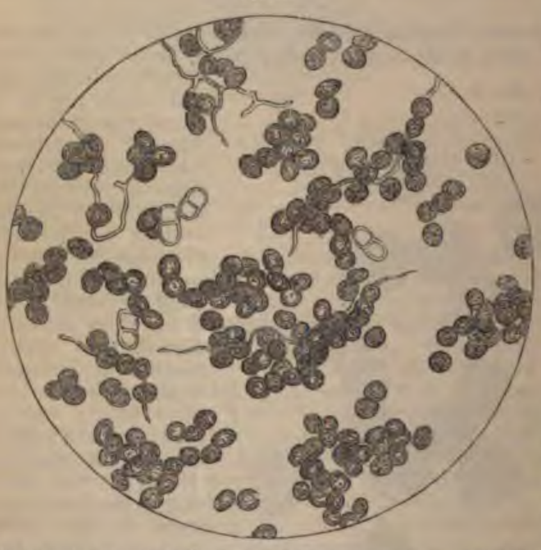
ON THE SMUT, OR DUST BRAND.

(*Uredo Segetum.*)

" This disease is produced by another fungus, which is often confound
the last. The smut-fungus indeed resembles the bunt-fungus in col
shape, but its spores are not half so large, and it possesses none of t
gusting odour which characterises the latter. Although this fungus i
rally supposed to attack the grain much in the same way as the bunt-
only that it more thoroughly destroys it, this is not the case. M. A. Bro
has shown that the smut-fungus destroys the ear, by first occasioning th
most parts of the flower to become abortive, whilst the little stalks (p
on which these are seated, swell and become very fleshy. The fungus th
sumes the whole of this fleshy mass, and at length appears between th
scales in the form of a black, soot-like powder. It is stated, however, by
that it does not
its attacks to t
and although
not myself wi
its effects on
parts, it is de
as infecting bot
straw, and leav
spores, when
burst through t
dermis, and d
in the form of
powder rese
charcoal.

" The diseas
so much drea
bunt, for two re
the spores hav
rally been dis
before the corn
and even when
in the flour the
no disagreeable
It is sometime
ever, very inj
by diminishin
produce. It is
paratively ra
wheat, but ver
mon in barley, and even more so in oats; rye does not appear to be
to it. It has been observed in several grasses."—*Professor Henslow.*

Fig. 53.



This engraving represents the spores of UREDO SEGETUM magnified 420 diameters. Drawing made from a preparation belonging to Dr. Swayne.

The spores are several times smaller than those of *Uredo caries*,
reticulated. *Fig. 53.*

ON THE RUST, RED-RAG, RED-ROBIN, RED-GUM.

(*Uredo rubigo* and *Uredo linearis.*)

" I believe that under the names here quoted, agriculturists have
ded the attacks of what systematic botanists consider to be two distinct

ungi ; and which the experienced eye of the microscopic observer was alone dy to separate. They form yellow and brown oval spots or blotches upon stem, leaf, and chaff; and when the spores have burst through the epidermis, are readily dispersed. Like those of the bunt-fungus and smut-fungus, consist of very minute grains, but their colour is different, varying from ge-yellow to brown, and their shape is not so perfectly spherical, especially e of *U. linearis* which are usually oblong. Both of these fungi are very mon on corn and grasses. I have within the last two months (of July and ust) seen more of the red-rag (*U. rubigo*), as it is here called, than of any r of these corn pests. It abounded in the form of an orange powder, which led from the inner surfaces of the chaff scales, but was scarcely if ever to be in the skin of the seed; it might also be traced in patches beneath the ermis of the straw, but I did not observe that it had burst through the ermis anywhere, excepting on the inside of the chaff. It seemed to prevail among the rough-chaffed wheats than others, and in this parish, more cially in some fields, of the variety called white tunstall. At one time it ared likely that these fields would be seriously injured by it, but some warm y weather coming on, the red-rag lost ground; and I observed that the or spots from whence the spores exuded, turned deep brown. This disease t so injurious as the true mildew; but although I shall speak of the latter it were produced by a distinct species of fungus, and in compliance with present opinions of most systematic botanists, still I am very much inclined ink that both diseases are occasioned by the same fungus, under different s or states of fructification."—*Prof. Henslow.*

ON THE MILDEW.

(*Puccinia Graminis.*)

If agriculturists appear to have confounded, under the name of rust, the ks of fungi which botanists consider to belong to two distinct species; so have they frequently applied the name of rust as well as mildew, to the se we are about to notice. It will be seen by what I have stated in the section that I am induced to consider these two diseases to be mere modifi-ns in the attack of the same species of fungus, but further observations are ired to settle this question. For the present, then, we must consider the ew fungus, not merely as a distinct species, but also as belonging to a different s from the two rust fungi. The form of its spores is indeed very different those we have already noticed. The ripe spores of this fungus are little, sely dark-brown, club-shaped bodies, having the thicker end divided into chambers well filled with sporules. They taper gradually at the base into e stalk. The sori or patches of spores are composed of multitudes of these es, which sometimes burst through the epidermis of the stem and leaves ch profusion that the whole plant appears as if it had been scorched. I observed this fungus intermixed with the rust fungi, in a way which gthens my opinion that they are identical."—*Professor Henslow.*

here appears to be considerable reason for believing that the spores of this us enter the grass, not by the roots but by the stomata.

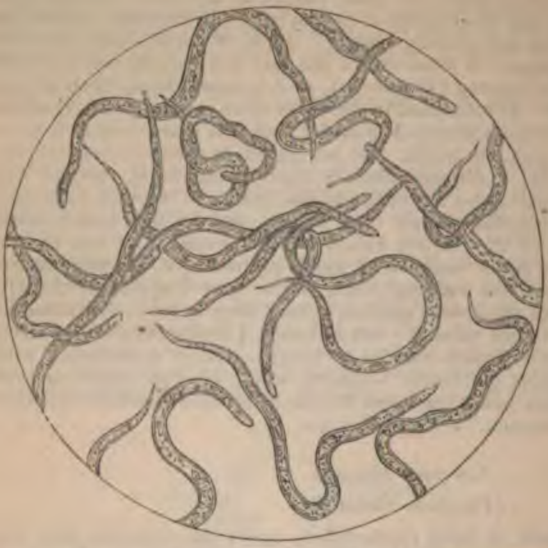
e have now to consider two diseases of corn, produced not by the invasion rasitic fungi, but animal productions.

ON THE EAR-COCKLE, PURPLES, OR PEPPERCORN.

(*Vibrio Tritici.*)

It is now just a century since Needham first made known an extraordinary concerning the blighted grains found in the ears of wheat infected by a se known under the name of ear-cockle, purples, or, as I find it called in part of Suffolk, the peppercorn. The grains which are thus infected turn green at first, and ultimately nearly black; and they become rounded, what resembling a small peppercorn, but with one or more deep furrows on surface. The husks of the chaff spread open, and the awns are twisted, by means the infected ears are readily observable among the standing corn. opening the blighted grains, they are found to be filled with a moist white cottony substance; but to contain no flour. When Needham placed this cottony mass under his microscope, he perceived, to his surprise, as I did lately to mine, before I was aware that the fact had been previously noticed, that it was composed of a multitude of minute eel-shaped animalcules, which were in active movement, twisting and wriggling to and fro, like so many eels or snakes. (See *fig.* 54.)

Fig. 54.



Numerous VIBRIONES TRITICI, magnified 100 diameters. Drawing made from preparation belonging to the late Dr. Pereira.

"The disease which the *Vibrio Tritici* occasions is said to be sometimes very injurious to the wheat-crop; but I presume it must be very local, for it was unknown to some of the earlier writers on the diseases of corn, who sought for it without success; and I could not learn, upon a limited inquiry, that it was known to the farmers near Cambridge, or at Saffron Walden. In this parish, however, it is well known, and my miller informs me that he often has samples of wheat much infested with it; and among what he calls the tail-corn (the last portions of a particular batch), he has found as much as half a peck in the bushel. He says, also, that when the cottony mass composed of the animalcules is extracted from the grain in the process of grinding, it does not pass through the cloth with the fine flour in the beating, but remains behind with the bran. When a sound grain of wheat is sown by the side of one infested with the *vibrio*, the young plant which springs from the former is not infected before March, but then the animalcules begin to find their way from the blighted grain into the earth, and thence into the young corn.

"The most curious circumstance which observers have noticed in the economy of this animal, and which I have had an opportuity of fully verifying, is the wonderful property it possesses of retaining its vitality under circumstances in which we should have supposed it impossible that it could have lived. If a mass of them is suffered to become so perfectly dried that the slight touch of a hair might reduce them to powder, and they are again moistened in a drop of water, they will speedily revive, and become as active as before. They may thus be dried and revived many times before they are killed. Mr. Bauer states the limit to such revivals to lie between six and seven years.

"It does not appear that this vibrio naturally attacks any other corn than wheat—at least it has not been observed to do so. But barley, rye, and oats may become infected by sowing them in the same hole with the grains of wheat which are filled with the vibrio. The experiment, however, succeeds with difficulty, and only to a small extent."—*Prof. Henslow.*

ON THE WHEAT-MIDGE.

(*Cecidomyia Tritici.*)

"Nothing is more common in wheat-fields than to find one, two, or more of *the flowers* in many ripe ears defective in the grain, even though the parts of the flower had been well formed. This effect may be owing to a variety of causes, and amongst others is frequently occasioned by a minute two-winged fly, called the wheat-midge. This fly may be seen in myriads in the early part of June, between seven and nine o'clock in the evening, flying about the wheat, for the purpose of depositing its eggs within the blossoms. From these eggs are hatched small, yellow maggots, which are the caterpillars of this fly, and by these the mischief is occasioned: they are the cause of the non-development or abortion of the ovary, so that the grain never advances beyond the state at which it appears at the time the flower first expands."—*Professor Henslow.*

A figure of the fly and its caterpillar is given in the *Transactions* of the Linnæan Society.

ON THE MANUFACTURE OF BREAD.

Two kinds of bread are manufactured—the one is made with yeast, ferment, or leaven, and is hence called leavened; the other is prepared without leaven, and is denominated unleavened; although not unfrequently substances are used in the manufacture of this description of bread, the operation of which is, to a certain extent, analogous to that of yeast.

Leavened or Fermented Bread.

Leavened bread should consist only of flour, yeast, and water, with perhaps a little salt; such is the composition of genuine home-made bread, the flavour of which is so agreeable, and so very different from that of ordinary bakers' bread.

In the preparation of the bread of the shops, flour of inferior quality is frequently used, and this is mixed up with large quantities of salt and alum; these substances impart to it a taste very distinct from that of home-made bread, and occasion much of the difference observed between the two descriptions of bread.

Yeast, or the Yeast-Plant.

The substance known as yeast is in reality a plant, belonging to the tribe of *Fungi;* it consists of a multitude of minute oval or circular bodies or sporules, endowed, under certain favourable circumstances, with extraordinary powers of growth and multiplication.

Three kinds of yeast are employed in the manufacture of bread—viz., brewer's yeast, German yeast, and patent yeast. Some bakers use one, and some another, but the greater number make use of patent yeast, on account of its cheapness. The fungus is of the same species in each.

Brewer's Yeast.—This, as is well known, is of a light-brown or fawn colour, and of a frothy consistence; when recent, it is in constant movement, and bubbles of gas escape from it.

Examined with the microscope, it is seen to consist of innumerable minute bodies, termed sporules, of variable size, some circular, and others oval, and all intermingled with very many globules of carbonic acid gas. These sporules multiply rapidly when the yeast is in an active condition.

Brewers and bakers "distinguish yeast according to the quality of the beer from which it is obtained. *Ale yeast* is the best and strongest, and is used for bread-making. *Porter yeast* is objected to by bakers, but is used in distilleries. *Small beer yeast* is said to be weak, but rapid in its effects, and is sometimes used in making rolls."—*Pereira.*

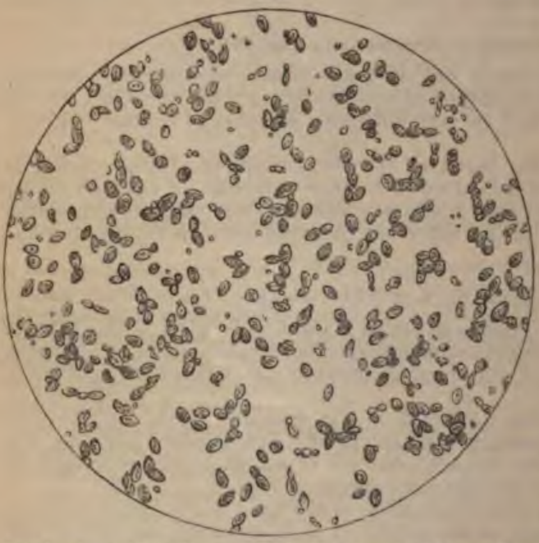
German Yeast.—This, which is sometimes called "*dried yeast,*" consists of sporules only, with but little adherent moisture, and no gas. It forms a paste-like substance, and is obtained from a fermented liquid by filtration. It is imported into this country principally from Germany, in hempen bags, each holding half a hundredweight. When placed in casks, it is apt to burst them, in consequence of the carbonic acid sometimes evolved.

The vitality of yeast is destroyed by mechanical injuries—heat, cold, and

chemical re-agents. Dr. Pereira relates a singular circumstance in refere
the effect of blows on yeast.

"A very curious fact was mentioned to me by the importer of Germa
Dutch yeasts, in Finch-lane, Cornhill, London. It is, that mechanical
kills or destroys yeast. Foreign yeast is imported in bags, and of these
care is requisite in their removal from place to place. If they be allowed
violently on the ground, the yeast is spoiled. A bruise or a blow given
bag also destroys it. The men who make up the dried yeast into quarter-
and half-pound balls for sale are obliged to handle it very dextrously, o
injure and destroy it. In fact, falls, bruises, or rough handling, kill it, a
yeast which has thus been mechanically injured may be readily disting
from good, unaltered yeast. Its colour becomes darker, somewhat li
change which an apple or pear undergoes when it becomes rotten; and
being crumbly or powdery, it becomes soft, glutinous, sticky to the finger
flour-paste, and even stinks. I have submitted some of this injured or
yeast to microscopical examination, but have been unable to detect an
ference in its appearance from healthy yeast. The effect of mechanical i
is also noticed by several writers. Thus Liebig remarks that simple pr
diminishes the power of yeast to excite vinous fermentation."*

Fig. 55.



This drawing exhibits the *sporules* of which a sample of PATENT YEAST was composed; they differ from the sporules of ordinary yeast in their smaller size, oval form, and in being frequently united in twos and threes: they appear to belong to a distinct fermentation fungus, but their development was not followed out. Drawn with the Camera Lucida, and magnified 220 diameters.

Patent Yeast.—
is prepared from
fusion of malt and
It is a thin watery
containing innum
sporules of the
plant in suspension
hops are added t
vent the liquid fr
coming rapidly so

This mode of
ration of patent y
considerably vari
different bakers.
add a portion of b
or German yeast
infusion cont
either flour or ma
potatoes. These
stances supply th
or nourishment
which the yeas
grow, and multip
much rapidity, as
the material for c
sion into carboni
Yeast-cells, in the
of a few days, mak
appearance in a
infusion of mal
sometimes even o

Patent yeast, before being mixed with the flour, is sometimes allo
drain through a copper basin or sieve perforated with numerous holes;
means the chief part of the mashed potato employed in the preparation
yeast is separated.

Discovery of the Development of the Yeast-Plant.

Few productions have created more interest or excited greater discussi
yeast; its nature and the mode of its operation have been made subjects
inquiry and dispute.

These points are now, however, to a very great extent, set at rest; its is generally admitted, and its *modus operandi* in panification is well d.

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* Materia Medica, New Edition, p. 937.

particular, however, the history of the yeast-plant was until very complete; this related to its development.

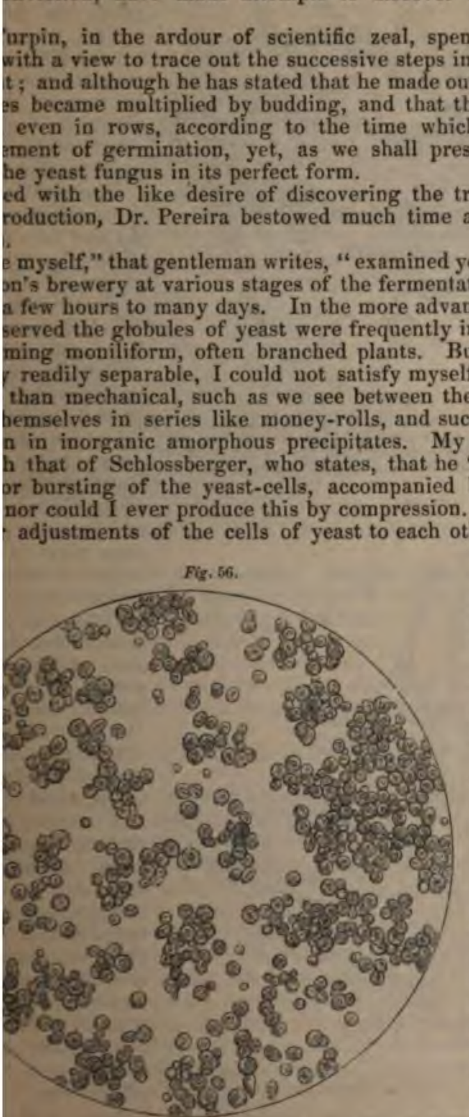
servers admit that the yeast fungus, as met with in the different forms use, is in an incomplete state of development, and many, influenced onviction, have made attempts to discover the plant in its perfect

urpin, in the ardour of scientific zeal, spent a whole night in a with a view to trace out the successive steps in the development of the t; and although he has stated that he made out distinctly that the cells es became multiplied by budding, and that they adhered together in even in rows, according to the time which had elapsed after the ement of germination, yet, as we shall presently see, he failed to he yeast fungus in its perfect form.

ed with the like desire of discovering the true development of this roduction, Dr. Pereira bestowed much time and attention in its ex-

e myself," that gentleman writes, "examined yeast at Messrs. Hanbury on's brewery at various stages of the fermentation of both porter and a few hours to many days. In the more advanced stages of fermenta-served the globules of yeast were frequently in strings or rows, appa-ming moniliform, often branched plants. But as the cells or joints readily separable, I could not satisfy myself that the adhesion was than mechanical, such as we see between the blood-discs when they hemselves in series like money-rolls, and such as we sometimes per-n in inorganic amorphous precipitates. My experience agrees pre-h that of Schlossberger, who states, that he 'never could perceive a or bursting of the yeast-cells, accompanied by a discharge of their nor could I ever produce this by compression. These curious brachial adjustments of the cells of yeast to each other appeared to me the work of chance.' It is, however, proper to add, that the artificial rupture of the cells has been effected by Mitscherlich, who also confirms Turpin's observation of the budding of the yeast-cells."

Fig. 56.



ng represents "THE YEAST-FUNGUS" in the first stage of its nt, or that of sporules. As generally met with, and as used in tation of bread, yeast consists of an immense number of simi-s intermixed with bubbles of carbonic acid. Drawn with the ucida, and magnified 220 diameters.

M. Robin*, after describing the development of the sporules by budding, remarks: "We know only this mode of propagation of this vegetable; but its fructification in the air has not been seen, nor can it be seen, because it perishes from the part at which it is in contact with the atmosphere; so that we cannot yet say whether it ought to be classed amongst the fungi which fructify only in the air, or even amongst the algæ, from which

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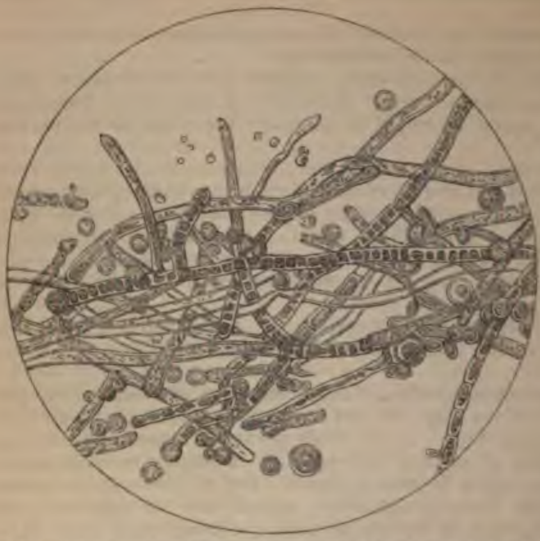
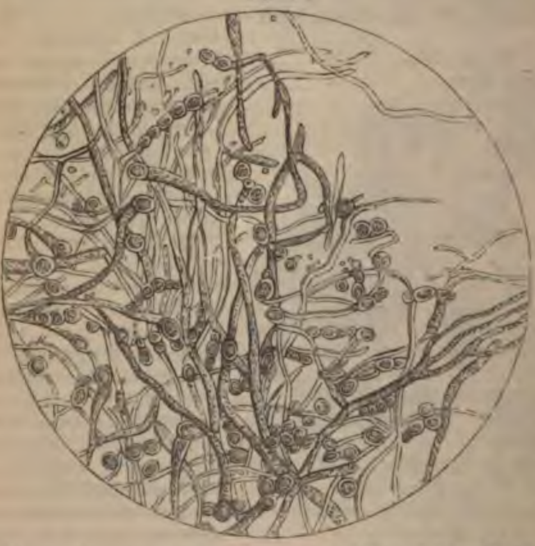
[*] Des Vegetaux qui Croissent sur l'Homme et sur les Animaux Vivants.

Fig. 57.



This engraving represents "THE YEAST-PLANT" in the second stage of its growth, or that of thallus; the jointed threads are intermixed with the two kinds of reproductive bodies developed on the vertical filaments of the thallus. Drawn with the Camera Lucida, and magnified 220 diameters.

Fig. 58.



This engraving represents a peculiar state or condition of "THE YEAST-FUNGUS;" the filaments consist chiefly of thallus, but in the course of many of them, single vesicles, of a somewhat oval form, have appeared; the cavities of these are in general but imperfectly filled with the granular matter, and the filament on one side of each vesicle is almost constantly enlarged, and void of contents. The vesicles appear to be formed, as in many *Algæ*, by the union of the contents of two or more cells, and the subsequent dilatation of the receiving cells. Drawn with the Camera Lucida, and magnified 220 diameters.

it is separated by very many particulars, and which fructify under the water."

Impelled with a similar desire, we have applied ourselves diligently to this investigation, and, more fortunate than our predecessors, have succeeded in tracing the yeast-plant through all the stages of its growth up to its perfect state.

The development of the yeast-plant may be divided into three very distinct and natural stages.

First Stage, or that of Sporules.—In this, the ordinary state in which the yeast-plant is met with, it consists entirely of sporules; these are for the most part separate, but sometimes feebly united in twos, threes, and even in greater numbers; they vary in size and form; some are several times smaller than others, and nearly all contain one or two nuclei, which are the germs of future sporules. (See *fig.* 56, p. 153.)

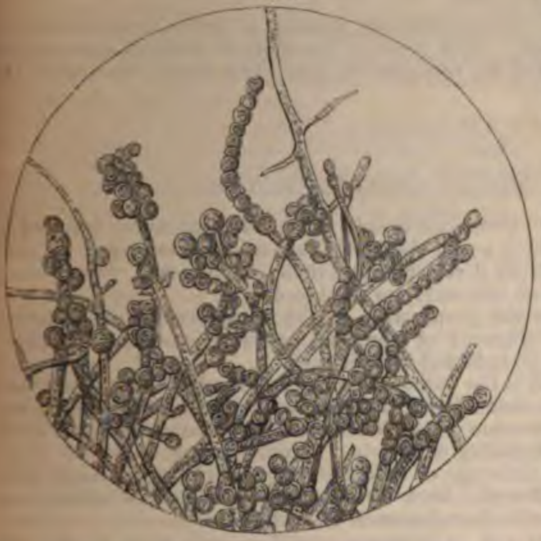
Second Stage, or that of Thallus.—After the lapse of some days, and under favourable circumstances, the sporules become much elongated; a division or partition appears in each, and it now consists of two distinct cells; the extension still continuing, other septa appear, until at length jointed threads, at first simple and undivided, afterwards jointed, are formed, and the plant now exists in the form of root-like threads or *thallus*.

The yeast-plant in the state of thallus constitutes the *Mycoderma Cerevisiæ* of Desmazières.

Third Stage, or that of Aërial Fructification.—After the lapse of a further time, vertical threads spring up from the thallus; these, when the plant has reached its complete development, become branched, each branch bearing at its extremity a row of rounded and beaded corpuscles.

These corpuscles are about the size of the original yeast sporules, but differ from those bodies in their darker colour and firmer texture.

Fig. 59.



Occasionally in the rows of beaded corpuscles one cell several times larger than the rest is seen.

From observation made subsequently on the development of the sugar fungus in saccharine wine, it appears that the beaded threads do not form the last condition or stage in the development of the plant, but that true aërial tufts or heads of sporules are formed.

These heads are figured and described in a Paper by ourselves published in the 36th volume of Medico-Chirurgical Transactions, p. 26. "The state and appearance of the heads vary with the development. At first they present a smooth outline, from being covered by a delicate membrane (Pl. V. *fig.* 2.); this afterwards bursting and becoming retracted, a rounded mass of circular sporules of a brownish colour is disclosed to view. The sporules falling off, leave the dilated extremities of the threads or filaments exposed."

A fungus, somewhat closely resembling the yeast fungus in its perfect form, has been observed by Bennett in the expectoration of an individual attacked with pneumothorax.

Such, then, is a very brief description of the development of the yeast-plant in its several stages.

From a consideration of the structure of the sporules of the yeast-plant, their evident fungoidal character, their rapid growth, &c., it occurred to us that the reason why the true or aërial reproduction had never been discovered was to be found in the fact, that yeast being used always in the state of sporules, sufficient time was not allowed it, under ordinary circumstances, to attain its full development, for which purpose probably many days would be required.

Acting on this impression, we placed in an eight-ounce bottle a tablespoonful of malt, poured over this about four ounces of hot water, and partially closing the mouth with a perforated cork, set it aside for a fortnight.

At the end of that time we were rejoiced to find that our expectations were fully realised, and that we had indeed discovered that which so many other observers had failed to detect. This discovery was made in August, 1850.

The aërial reproduction of this plant clearly shows that the German algologist Kutzing is in error, in regarding it as a confervoid production.

Modus Operandi of Yeast.

The presence of yeast in a substance containing sugar, or starch convertible into sugar and nitrogenised matter, induces certain chemical changes, comprehended under the term vinous or alcoholic fermentation.

These changes in the making of bread consist in the conversion of the sugar of flour into alcohol and carbonic acid gas; the latter, in its efforts to escape from the dough with which it is mixed, distends it, forming vesicular spaces in its interior, and so causing it to become porous and light.

According to some chemists, a minute portion of the starch is itself converted into sugar. If we examine attentively with the microscope the starch-corpuscles contained in fermented and baked bread, we observe that they are still entire, although altered somewhat in form.

Some physicians are of opinion that the presence of yeast imparts injurious properties to leavened bread. This point is one of great practical importance; but so far as we are aware, no complete or conclusive observations have yet been made on the subject.

UNLEAVENED OR UNFERMENTED BREAD.

There are two kinds of unfermented bread: in the one, substances are used in imitation of yeast, from which a gas, always the carbonic, is disengaged, distending the dough, and rendering it vesicular and light; in the other, flour, water, with perhaps the addition of salt, only are employed.

The substances used in the preparation of the finest description of unfermented bread are sesquicarbonate of ammonia, carbonate of soda and hydrochloric acid, or carbonate of soda and tartaric acid.

Of these, by far the best is the carbonate of ammonia: this is a volatile salt, and its great advantage is, that it is entirely or almost entirely dissipated by the heat employed in the preparation of the bread; and thus the necessary effect is produced without much possibility of injurious results ensuing.

In the employment of carbonate of soda and hydrochloric or muriatic acid, the case is, however, different; here we have the formation of chloride of sodium, or common salt, with disengagement of carbonic acid.

Now, although the use of salt, in moderate quantities, with meat, is a general custom, and is probably a salutary one, the effects of this substance on the human system are by no means so clearly ascertained as to justify its use in large quantity in so important an article of consumption as bread.

In those instances where a mixture of carbonate of soda and tartaric acid are used, a tartrate of soda is formed, also with liberation of carbonic acid.

In reference to the action of this salt, we meet with the following observations in the last edition of Dr. Pereira's voluminous but excellent Materia Medica:—

"In its medicinal properties, tartrate of soda resembles the tartrate of potash. It is a gentle aperient. If it be given so as to become absorbed it operates as a diuretic, and renders the urine alkaline. It may be used, therefore, in lithic-acid deposits, but it is objectionable when there are phosphatic deposits in the urine. Dose, as a purgative, two to four drachms, or more. As a diuretic or lithic, it must be given in smaller doses, and largely diluted with water, so as to ensure absorption."

The preparations known as *Baking*, *Egg*, and *Custard powders* are combinations of carbonate of soda and tartaric acid, mixed up with wheat-flour, or other kinds of starch, and often coloured with either *turmeric* or *chromate of lead*.

It is therefore extremely doubtful how far these preparations may be used with safety to the public health: for our own part, we see much less objection in the employment, in the generality of cases, of a substance like yeast, which contains but little saline matter, and the vitality of which is completely destroyed by the heat of the oven, than in the use of egg and baking powders.

A sample of "Borwick's Baking Powder" forwarded to us we found composed of an acid and an alkali—tartaric acid, and either carbonate of potash or soda, probably the former, together with ground rice, a small quantity of wheat-flour, and perhaps a little sugar. Its action in lightening or leavening bread is dependent upon the slow extrication of carbonic acid gas, which, becoming diffused throughout the dough, forms the little cavities noticeable in white bread, and der it porous and spongy. As soon as the flour throughout which the wder has been diffused is moistened with water, the tartaric acid unites soda or potash, forming a tartrate of one or other of these bases, either salts possesses diuretic and aperient properties. It is on this account d made with these powders, while it may prove of service in some yspepsia, in others is calculated to do harm. Most of the other baking-also consist of tartaric acid and either carbonate of soda or potash, h different kinds of flour or farina. According to a plan commonly some time since, the liberation of the carbonic acid gas was effected by hydrochloric acid added to the dough containing the alkali; in this case e of sodium or common salt was formed instead of tartrate of soda or in the present instance.

ter we drink is largely impregnated with a host of saline ingredients; we eat is saturated with alum and "stuff;" and it behoves us to be w we add to the large amount of saline matter daily ingested.

ese observations are not misplaced or over-strained will appear from ing published receipts for the preparation of unfermented bread:—

To make White or Flour Bread.

dressed or household	3 lb. avoirdupoise.
bonate of soda, in powder	9 drachms, Apothecaries' weight.
ochloric (muriatic) acid	11¼ fluid drachms.
r	about 25 fluid ounces.

the large quantity of soda and acid recommended to be employed in facture of a 3lb. loaf; and remember that it is no easy matter either to ally the ingredients, or exactly to add them in neutralising pro-

reira gives the following receipt for the manufacture of unfermented which the proportions of soda and acid are much less:—

Receipt for Unfermented Bread.

Flour	1 lb.
Bicarbonate of soda	40 grains.
Cold water	½ a pint.
Muriatic acid	50 drops.

Receipt for an Egg or Baking Powder.

Carbonate of soda	56 lbs.
Tartaric acid	28 lbs.
Potato-flour	1 cwt.
Turmeric powder	¾ lb.

e observed that the quantity of tartaric acid in this receipt is much too eutralise the soda. It is better adapted for pudding than bread.

cond description of unfermented bread is heavy and compact, and is chiefly in the form of biscuits.

THE DIFFERENT KINDS OF BREAD.

Bread.—The following observations, in reference to the increased on of wheaten bread, extracted from "M'Culloch's Dictionary of Com-ill be read with interest:—

pecies of bread in common use in a country depends partly on the e inhabitants, but more on the sort of grain suitable for its soil. But ority of wheat to all other farinaceous plants, in the manufacture of so very great, that wherever it is easily and successfully cultivated, read is used, to the nearly total exclusion of most others. Where, however, the soil or climate is less favourable to its growth, rye, oats, &c. used in its stead. A very great change for the better has, in this respect, t place in Great Britain within the last century. It is mentioned by Harriso his description of England (p. 168.), that in the reign of Henry VIII. the g had wheat sufficient for their own tables, but that their *household* and neighbours were usually obliged to content themselves with rye, barley, oats. It appears from the household book of Sir Edward Coke, that, in 1 rye-bread and oatmeal formed a considerable part of the diet of servants, in great families, in the southern counties. Barley-bread is stated in the g of a monopoly by Charles I., in 1626, to be the usual food of the ordinary of people. (*Sir F. M. Eden on the Poor*, vol. i., p. 561.) — At the Revolu the wheat produced in England and Wales was estimated by Mr. King and Davenant to amount to 1,750,000 quarters. (*Davenant's Works*, vol. ii. p. 2 —Mr. Charles Smith, the very well informed author of the Tracts on the C Trade, originally published in 1758, states that in his time wheat had bec much more generally the food of the common people than it had been in 1 but he adds (2nd ed., p. 182; Lond. 1766), that notwithstanding this incre some very intelligent inquirers were of opinion that even then not more *half* the people of England fed on wheat. Mr. Smith's own estimate, whic very carefully drawn up, is a little higher; for, taking the population of E land and Wales in 1760, at 6,000,000, he supposed that 3,750,000 were sumers of wheat; 739,000, of barley; 888,000, of rye; and 623,000 of Mr. Smith further supposed that they individually consumed, the first cl 1 quarter of wheat; the second, 1 quarter and 3 bushels of barley; the th 1 quarter and 1 bushel of rye; and the fourth, 2 quarters and 7 bus of oats.

"About the middle of last century, hardly any wheat was used in northern counties of England. In Cumberland the principal families u only a small quantity about Christmas. The crust of the goose pie, with wh almost every table in the country is then supplied, was, at the period referred almost uniformly made of barley-meal. (*Eden on the Poor*, vol. i. p. 564. Every one knows how inapplicable these statements are to the condition of people of England at the present time. Wheaten bread is now universally m use of in towns and villages, and almost everywhere in the country. Barle no longer used, except in the distilleries and in brewing; oats are emplo only in the feeding of horses; and the consumption of rye-bread is comparati inconsiderable. The produce of the wheat crops has been, at the very le *quadrupled* since 1760. And if to this immense increase in the supply wheat, we add the still more extraordinary increase in the supply of butch meat, (see art. 'Cattle,') the fact of a very signal improvement hav taken place in the condition of the population in respect of food, will obvious.

"But great as has been the improvement in the condition of the people England since 1760, it is but trifling compared to the improvement that taken place since the same period in the condition of the people in Sc land."

Rye-Bread. — Rye-bread is rather less nutritious than that made from wh but it contains a greater proportion of sugar.

Rye-bread is still extensively used in some countries, particularly in Rus In England it is but little used; it is occasionally made by the London bak and may be procured of Inglis, New-street, Covent-garden.

We are indebted to Dr. Bossey, of Woolwich, for a sample of *Russian black bread;* it is of a dark-brown colour, not unlike that of gingerbr Water in which it has been macerated becomes deeply tinged; does this col proceed from the rye itself, or is it due to admixture with some o substance?

Barley-Bread.—Barley-bread is scarcely ever met with in this country, only baker known to us in London who prepares it, is Inglis, of New-str Covent-garden.

It is less nutritious than wheat bread, and more difficult of digestion.

Indian-Corn Bread.—Indian-corn bread, although rather less nutritious le from wheat, is more fattening, in consequence of the greater quantity ontained in it.

elieve there are many bakers in London who make bread of Indian-corn, e; it may be purchased of Turner, Bishopsgate-street, and Inglis, New-Covent-garden.

Bread.—Rice-flour is scarcely ever made into bread; although it is said ot unfrequently mixed with wheat-flour intended for bread.

Bread. — Bread is seldom prepared from oatmeal, which is, however, used in Scotland and the North of Ireland in the form of oat-cake.

ADULTERATION OF BREAD.

d is subject to the same adulterations as flour; the reader is there-ferred to what has been advanced on this subject under the head of

e are, however, certain adulterations to which bread is stated to be pecu-iable; these we shall now proceed to consider.

lteration with Rice-Flour. — It is asserted that this adulteration is very tly practised. The purpose for which rice-flour is employed is, to enable ad to absorb and retain a larger quantity of water than it would other-, and so cause it to weigh more. This iniquitous purpose is accomplished h the absorbent power of rice for water. In a loaf adulterated with ur the consumer is cheated of a certain amount of nutritious wheat the place of which is supplied by water.

characters and structure of the starch-corpuscles of rice have already escribed.

lteration with Boiled and Mashed Potatoes. — This adulteration, next by alum, is, perhaps, the one which is most commonly resorted to.

n the cost of flour was double what it now is, the inducement to mix it otatoes was very great; at the present time, however, the difference in etween potatoes and flour is less considerable, and the same inducement ot exist to the employment of potatoes in the manufacture of bread.

great objection to the use of potatoes in bread is, that they are made to e place of an article very much more nutritious.

adulteration may be readily detected by means of the microscope. The hich contain the starch-corpuscles are in the potato very large; in the tato these are adherent to each other, and form a reticulated structure, in shes of which the well-defined starch-granules are clearly seen: in the potato, however, the cells separate readily from each other, each forming nct atricle, and the starch-corpuscles are much less distinct, and much in form.

lteration with Alum and "Stuff." — This adulteration is practised with ld object — first, to render flour of a bad colour and inferior quality white, ual, in appearance only, to flour of superior quality; and second, to the flour to retain a larger proportion of water, by which the loaf is made h heavier.

e bakers buy rock-alum in powder, and mix it up in certain proportions lt; the majority, however, make use of an article known in the trade as " and "*stuff.*"

consists of a mixture of alum and salt. It is kept in bags, holding from er to one hundredweight; it is sold by the druggist, who supplies either er or the corn-chandler; the latter again, in some cases, furnishing the ith it from time to time as he may require.

untry towns and villages the baker is put to considerable trouble to pro-supplies of "stuff;" for as he is unwilling that his friends and neighbours know that he makes use of any such article in his bread, he generally es to procure it of a druggist living some miles away from his own town.

On a Saturday night a druggist in good business will have several appli in the course of the evening for alum, hards, and stuff.

It is not easy to ascertain the exact quantities of alum and "stuff" u bread. It may be stated as a rule, however, that the worse the flour, the the proportion of these ingredients.

In reference to the quantity of alum employed, Accum writes as follow

"The smallest quantity of alum that can be employed with effect to p a white, light, and porous bread from an *inferior* kind of flour, I have n baker's authority to state, is from three to four ounces to a sack of flour ing 240 pounds."

Dr. P. Markham gives eight ounces of alum as the quantity commonl in making a sack of flour into bread.*

Mitchell gives the following as quantities detected by him in different weighing four pounds each.

	Grains of Alum.
1st loaf	116
2nd „	114
3rd „	109
4th „	108
5th „	105
6th „	94
7th „	58
8th „	41
9th „	40
10th „	34½
Total in ten loaves	819½

Taking the yield of a sack of flour at 92 loaves, of four pounds eac above table gives nearly sixteen ounces as the *average* quantity of alum u making a sack of flour into bread; but at the rate of 114 grains to the lo amount would be nearly twenty-two ounces to the sack.

On the Detection of Alum.—Alum is a sulphate of alumina and potasl analysis of this substance, therefore, naturally resolves itself into two that for the detection of sulphuric acid and that for the discovery of the alı In most cases it is sufficient to test for the alumina only.

First char 1000 grs. of the flour or bread, then boil in a flask with 4 dr of nitric acid, 4 of hydrochloric, and 4 of water, evaporate to dryness; whe add one ounce of distilled water and boil for a few minutes; while boiling with two ounces liq. potassæ, and boil again for a few minutes; then neutralize with hydrochloric acid, and precipitate with ammonia.

The precipitated alumina should be washed, dried, ignited in a platinun and weighed.

That alum is in no way necessary in the manufacture of bread is proved, by the excellent quality of bread, as, for example, home-made made without a particle of that substance being used.

Alum "hards" and "stuff," are used solely for the benefit of the bal enhance his profits, and this, too, as we shall presently see, at the expe health.

Bakers endeavour to excuse themselves for the use of alum, on the ple the public will have very white bread, and that without alum this can made. The answer to this assertion is, that a white bread may be mad a flour of *good* quality, and that it is better that it should even be rath white than that a substance should be used injurious to health. The abov it will be observed, takes no notice of the extra quantity of water whi bread retains by its admixture with alum.

It is curious to notice how constantly the adulterating shopkeeper ende to shelter himself, and to excuse his dishonest practices, under the as

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* Considerations on the Ingredients used in the Adulteration of Bread-flour and Bread.

t the public "like it," and "will have it." We have recently heard the
cory-loving grocers assert that the public "like it," and "will have it," as
ugh the public were such great fools as actually to experience pleasure, not
ly in being cheated of their money, but robbed frequently of health as well.

That alum, in the doses in which it is present in bread, is injurious to health,
will now proceed to show.

" Alum is probably injurious to plants.

" Bourgelat has seen a phthisical condition induced in horses by the use of
um in too great quantities.

" Alum acts chemically on the animal tissues and fluids. If a solution of it
water be added in certain proportions to albumen, it causes a white precipi-
te. It also forms insoluble combinations with milk and with gelatine. These
enomena explain the action of alum on the fibrinous, albuminous, and
latinous constituents of the living tissues.

" The immediate topical effect of a solution of alum is that of an astringent—
amely, corrugation of fibres and contraction of small vessels, by virtue of
hich it checks or temporarily stops exhalation and secretion, and produces
leness of parts by diminishing the diameters of the small bloodvessels. It
by these local effects that alum, when taken internally, causes dryness of the
outh and throat, somewhat increases thirst, checks the secretions of the ali-
entary canal, and thereby diminishes the frequency and increases the con-
stency of the stools, as observed by Wibmer, in his experiments made on
mself with alum, in doses of three grains dissolved in five drachms of water,
d taken several times during the day.

" But when alum is applied to a part in large quantities, and for a longer
riod, the astriction is soon followed by irritation, and the paleness by preter-
tural redness. And thus, taken internally in large doses, alum excites
usea, vomiting, griping, purging, and even an inflammatory condition of the
estinal canal—effects which may be perhaps induced by small quantities in
rsons endowed with unusual or morbid sensibility of the stomach and bowels,
in the case of the lady in whom dangerous gastro-enteritis was apparently
luced by a single dose of a solution containing between ten and twenty grains
burnt alum.

" After its absorption, alum appears to act as an astringent or astringent
nic on the system generally, and to produce more or less general astriction of
tissues and fibres, and a diminution of secretion. Such at least appear to
its effects in some passive hæmorrhages and mucous discharges. Barbier
s alum "irritates the lungs, and often produces cough," but I am not aware
any other practitioner having confirmed this statement. Kraus observes that
urine becomes remarkably acid from the use of alum."*

On the Addition of Chloride of Sodium or Salt to Bread.—The quantity of
t used in the preparation of bread is six or eight times greater than that of
im. It is generally stated at from four to six pounds to the sack of flour.

The latter estimate gives to each quartern loaf upwards of an ounce of salt;
e is reason to believe, however, that the quantity employed is frequently
ch greater.

With fresh meat salt is commonly considered to be wholesome, and it pro-
ly is so, but it is doubtful whether the use of it in bread in such large quan-
ies is conducive to health.

In doses by no means considerable, salt exerts a perceptible influence over the
tions, lessening their amount, and producing heat and thirst.

Salt has the same effect on flour as alum, although its action is less powerful
that is, it whitens the flour and enables it to hold more water.

On the Adulteration of Bread with Sulphate of Copper.—Sulphate of copper
y small quantities exerts an extraordinary effect on the colour and re-
e capabilities of bread for water.

this property, bakers have been found on the continent, especially in
m, wicked enough to avail themselves. In England no instance of the
yment of this deadly poison is known in the manufacture of bread.

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* Pereira's Materia Medica.

The use of copper basins or sieves for the yeast to drain through is ver common; a practice in itself not wholly free from danger.

The detection of even minute quantities of copper in bread is not difficult.

On the Adulteration of Bread with Carbonate of Magnesia.—The employment of this earthy salt has been actually recommended, on scientific authority, in the manufacture of bread.

Many years since, Mr. C. Davy took the trouble to make experiments, and to write an article on its use.

Carbonate of magnesia improves the colour of new and inferior flour, and increases the yield, neither of which results, so far as the public are concerned, are in the least desirable. The increased yield simply signifies *more water.*

The amount of magnesia required varies from *twenty to forty grains to the pound of flour*, according to the quality of the latter: from the use of this salt, in these quantities, Mr. Davy did not see the slightest objection.

We, however, are of a different opinion, and entertain a well-founded objection to the admixture, on such a wholesale scale, of earthy and almost insoluble substances in any article of our food, especially so important a one as bread.

State of the Law with respect to the Adulteration and Weight of Bread.—The following abstract is taken from M'Culloch's "Dictionary of Commerce:"—

"Under the assize acts, bakers are restricted to bake only three kinds of bread,—viz., wheaten, standard wheaten, and household; the first being made of the finest flour, the second of the whole flour mixed, and the third of the coarser flour. The loaves are divided into peck, half-peck, eight pounds eleven ounces, and the quartern, four pounds five and a half ounces, avoirdupois.

"Now, however, it is enacted, that within the City of London, and in those places in the country where an assize is not set, it shall be lawful for the bakers to make and sell bread made of wheat, barley, rye, oats, buck-wheat, Indian corn, peas, beans, rice, or potatoes, or any of them, along with common salt, pure water, eggs, milk, barm, leaven, potato or other yeast, and *mixed in such proportions as they shall think fit.* (3 Geo. 4. c. 106. § 2.; and 1 & 2 Geo. 4. c. 50. § 2.)

"It is also enacted, by the same statutes, that bakers in London, and in the country, that is, in all places ten miles from the Royal Exchange, where an assize is not set, *may make and sell bread of such weight and size as they think fit*, any law or assize to the contrary notwithstanding. But it is at the same time enacted, that such bread shall always be sold by avoirdupois weight, of sixteen ounces to the pound, and in no other manner, under a penalty, for every offence, of not more than forty shillings; except, however, French or fancy bread, or rolls, which may be sold without previously weighing the same.

"Bakers or sellers of bread are bound to have fixed, in some conspicuous part of their shop, a beam and scales, with proper weights, for weighing bread; and a person purchasing bread may require it to be weighed in his presence. Bakers and others sending out bread in carts are to supply them with beams, scales, &c., and to weigh the bread, if required, under a penalty of not more than *5l.* (3 Geo. 4. c. 106. § 8.)

"Bakers, either journeymen or masters, using alum or any other unwholesome ingredients, and convicted on their own confession, or on the oath of one or more witnesses, to forfeit not exceeding *20l.* and not less than *5l.*, if beyond the environs of London, and not exceeding 10*l.*, nor less than *5l.*, if within London or its environs. Justices are allowed to publish the names of offenders. The adulteration of meal or flour is punishable by a like penalty. Loaves made of any other grain than wheat without the city and its liberties, or beyond ten miles of the Royal Exchange, to be marked with a large Roman M, and every loaf so exposed. (1 & 2 Geo. 4. c. 50. § 6.)

"Any ingredient or mixture found within the house, mill, stall, shop, &c., of any miller, mealman, or baker, which, after due examination, shall be adjudged to have been placed there for the purpose of adulteration, shall be forfeited, and the person within whose premises it is found punished, if within the city of London and its environs, by a penalty not exceeding 10*l.*, nor less than for the first offence; *5l.* for the second offence; and *10l.* for every subse- offence. (3 Geo. 4. c. 106. § 14.) And if without London and its en- , the party in whose house or premises ingredients for adulteration shall nd, shall forfeit for every such offence not less than *5l.*, and not more 0*l.* (1 & 2 Geo. 4. c. 5. § 8.)

us appears —

That the adulteration of bread with alum is an offence against the law, nishable by a penalty not exceeding 20*l.*

That the law requires that all bread (except French, fancy bread, and lls) should be weighed; and the purchaser may require this to be done en when the bread is delivered by the baker at the house.

the above are fit and proper requirements few will deny; that also the pecting the adulteration and weight of bread is daily violated with im- is notorious.

forefathers considered, and we think rightly, that to adulterate food and and to convert that which should be a source of health and strength into injury and disease, was no light offence. Acting on this feeling, they much pains to frame laws calculated to meet an evil of great and un- d magnitude.

present rulers are of a different opinion, and appear to consider that ion on such matters is wholly unnecessary; for they not only permit existing enactments relating to food and drink to be scandalously vio- but they even suspend Acts of Parliament, to give greater facilities for ation, as has now been done, for some years, in the case of coffee and .

conduct is not calculated to increase our respect for the law, or those duty it is to execute it.

have lately heard the present Chancellor of the Exchequer, Sir Charles express the greatest reluctance to institute excise prosecutions against adulterating coffee. We are at a loss to understand why any such re- e should be either expressed or entertained. Is not the adulteration of and other articles of consumption morally wrong; and is it not, more- crime against the law? Then upon what grounds is the perpetrator of offence to be permitted to escape the punishment justly his due?

be consistent, the Chancellor ought to express the same antipathy to tion in cases of theft or murder.

ntertain but little sympathy for crime in any form, and are not anxious e out excuses for those who, through the food we consume, cheat us of ney, and sometimes rob us of health.

ts of the Microscopical and Chemical Analyses of Twenty-eight ples of Bread, purchased at the Establishments of Bakers resi- in the Metropolis.

1st Sample.—Purchased in Judd-street.
Adulterated—with *alum.*

2nd Sample.—Purchased in Whitechapel-road.
Adulterated—with *alum.*

3rd Sample.—Purchased in Chapel-street, Somers-town.
Adulterated—with *much alum.*

4th Sample.—Purchased in Judd-street.
Adulterated—with *alum.*

5th Sample.—Purchased in Skinner-street, Somers-town.
Adulterated—with *alum.*

6th Sample.—Purchased in New-street, Covent-garden.
Adulterated—with *a considerable quantity of alum.*

7th Sample.—Purchased in Long-lane, Barbican.
Adulterated—with *much alum.*

8th Sample.—Purchased in Drury-lane.
Adulterated—with *a considerable quantity of alum.*

9th Sample.—Purchased in Chapel-street, Somers-town.
Adulterated—with *alum.*
10th Sample.—Purchased in Clare-street.
Adulterated—with *very much alum.*
11th Sample.—Purchased in Clare-street, Clare-market.
Adulterated—with *a considerable quantity of alum.*
12th Sample.—Purchased in Drury-lane.
Adulterated—with *very much alum.*
13th Sample.—Purchased in Lower Marsh, Lambeth.
Adulterated—with *alum.*
14th Sample.—Purchased in Lower Marsh, Lambeth.
Adulterated—with *alum.*
15th Sample.—Purchased in the Barbican.
Adulterated—with *much alum.*
16th Sample.—Purchased in Upper Whitecross-street.
Adulterated—with *alum.*
17th Sample.—Purchased in Whitecross-street.
Adulterated—with *very much alum.*
18th Sample.—Purchased in Upper Whitecross-street.
Adulterated—with *alum.*
19th Sample.—Purchased in High-street, Marylebone.
Adulterated—with *alum.*
20th Sample.—Purchased in High-street, Marylebone.
Adulterated—with *alum.*
21st Sample.—Purchased in Drury-lane.
Adulterated—with *alum.*
22nd Sample.—Purchased in Whitecross-street.
Adulterated—with *alum.*
23rd Sample.—Purchased—
Adulterated—with *alum.*
24th Sample.—Purchased in Whitecross-street.
Adulterated—with *a considerable quantity of alum.*

It is to be observed,—

1st. That the whole of the *twenty-four samples of bread* examined *were*
terated with alum.

2nd. That in *no one of the samples was potato, or any other farina*
matter, other than wheat-flour, detected; nor did any of the breads co
either carbonate or sulphate of lime.

While the weight of the ash left after the incineration of the samples of
the analyses of which have already been given, varied from three to four,
in one case six grains to the ounce, being usually only three grains, that of
ash of the incinerated breads varied from seven to fourteen grains, and in
instance it even reached twenty-one grains.

These weights convey some idea of the quantity of saline matter presen
bread adulterated with alum. It must be remembered, however, that the
of crystallisation, which forms a considerable part of the weight of most
is expelled by the incineration, and that therefore the quantity of saline in
dients actually present is much greater than the weight of the residual ash.

THE LEAGUE BREAD COMPANY.

In June of the present year, 1851, the League Bread Company issued a
address or advertisement, soliciting the confidence and support of the pu
mainly on the ground that the bread manufactured by it did not contain a
The following quotation is taken from this advertisement:—

"The great and chief recommendations of the bread manufactured by
company are, its perfect purity, being warranted free from alum or any
pernicious ingredient, and the great care and cleanliness enforced in its m
facture."—*Times.*

These statements are accompanied by certificates from Dr. Ure and
Scanlan.

To what extent either the statements or the certificates are to be relied upon, respects alum, will appear by the accompanying analyses.

5th *Sample.* — Purchased at the League Bread Company's Depôt, 10. Charles-street, Middlesex Hospital.

Adulterated — with *much alum.*

6th *Sample.* — Purchased at the League Bread Depôt, University-street, Tottenham-court-road.

Adulterated — with *a small quantity of alum.*

7th *Sample.* — Purchased at the Depôt, 3. Broad-street, Golden-square.

Adulterated — with *a large quantity of alum.*

8th *Sample.* — Purchased at the Depôt, James-street, Oxford-street.

Adulterated — with *much alum.*

It thus appears, contrary to the written statement and warranty of the League, at alum is contained in the bread vended by that Company.

When we became aware how general was the use of alum amongst bakers, membering the declaration of the League Bread Company above referred to, occurred to us that we should at least have it in our power to inform the public here bread free from alum might be procured; in this expectation we regret find that we have been unexpectedly disappointed.

ON THE WEIGHT OF BREAD.

The weight of a loaf of bread is made up not alone by the flour contained in but depends to a considerable extent upon the water present.

Flour in its ordinary state is estimated to contain about seventeen per cent. water; but the quantity in new flour is greater than in old.

Bread made without either alum or salt contains, as we shall see presently, a ry much larger per-centage of water. Made with alum and salt, the pro-rtion is still higher. And when, with these ingredients, rice-flour is used, the antity of water imbibed and retained is even greater.

Again, new bread weighs more than stale, the latter losing a portion of its ater by evaporation.

This circumstance is well known to bakers, with whom it is a common prac- to throw empty sacks over the loaves, as soon as they are taken out of the en, to prevent the escape of water.

Owing to this circumstance, it is frequently required in contracts that the ead should be delivered cold, and of the full weight.

In order to ascertain the extent to which the weight of bread is affected by rtain of the causes above referred to, Mr. Guttridge, baker, of Shepherd's-sh, carefully prepared, under our direction, three loaves, the composition of hich was as follows: —

The *first loaf* consisted of flour two pounds, of water and German yeast a ficient quantity.

The *second loaf* contained, in addition, two scruples of alum and half an ounce salt.

In the *third loaf* there were the same ingredients, but half a pound of the at-flour was replaced by the same quantity of rice-flour.

Immediately on removal from the oven, the first loaf was found to weigh two unds eight ounces and a half, that is, it had taken up eight ounces and a half ater additional; the second, two pounds ten ounces, so that, deducting the m and salt, it retained nearly nine ounces and a half; and the third, two unds ten ounces and a half, it containing nearly ten ounces of water in ad- to the seventeen per cent. belonging to the flour from which the bread was

the end of twenty-four hours, the weights were as follows, — first loaf, two s, seven ounces, seven drachms; — second loaf, two pounds, nine ounces, drachms, one scruple; — third loaf, two pounds, ten ounces, one scruple. the first loaf had lost five drachms, or more than half an ounce; the loaf less than five drachms, and more than four drachms; the third loaf an four drachms.

It thus appears that a loaf without alum is less retentive of water than with, and that with rice the most so; also that the loss of a loaf in weight day old is usually, for every two pounds of flour, about half an ounce.

Table showing the Weight of Bread as delivered at Houses.

Loaves.		Weight.
1st Baker.		
Quartern, new	deficient	3¼ oz.
Ditto ,,	,,	1¾
Ditto, one day old	,,	2¼
Half-quartern, new	,,	1½
Ditto, stale	,,	2½
Deficiency in four quarterns		11½
2nd Baker.		
Half-quartern, one day old	deficient	1
Ditto ,,	,,	1¾
Ditto ,,	,,	1
Ditto ,,	,,	2½
Deficiency in two quarterns		6¼
3rd Baker.		
Half-quartern, one day old	deficient	2
Ditto ,,	,,	2
Deficiency in one quartern		4
4th Baker.		
Quartern, new	deficient	2
Ditto, stale	,,	2½
Deficiency in two quarterns		4½
5th Baker.		
Quartern, new	no deficiency.	
Ditto, stale	deficient	2½
Deficiency in two quarterns		2½
6th Baker.		
Half-quartern, one day old	deficient	1
Ditto ,,	,,	2
Ditto ,,	,,	0¼
Deficiency in a quartern and a half		3¼
7th Baker.		
Half-quartern, one day old	deficient	1
Ditto ,,	exact weight	
Ditto ,,	rather over weight	
Deficiency in a quartern and a half		Less than 1 oz
8th Baker.		
Quartern, one day old	deficient	1¼
Ditto ,,	,,	1½
Ditto ,,	,,	1
Ditto ,,	,,	1½
Deficiency in four quarterns		5¼

9th Baker.

Loaves.		Weight.
Half-quartern, one day old	deficient	2 oz.
Ditto "	"	2
Deficiency in one quartern		4

10th Baker.

Quartern, one day old	deficient	3¾
Ditto "	"	3½
Ditto "	"	2¾
Ditto "	"	4
Half ditto "	"	2¼
Half ditto "	"	2
Half ditto "	"	2½
Deficiency in 5½ loaves		1 lb. 5¼ oz.

11th Baker.

Half-quartern, one day old	deficient	1¾
Ditto "	"	1½
Ditto "	"	1½
Ditto "	"	2
Total deficiency in four half-quarterns		6¾

12th Baker.

Quartern, one day old	deficient	3
Ditto "	"	3½
Total deficiency in two quarterns		6½

13th Baker.

Half-quartern, one day old	deficient	0½
Ditto "	"	1½
Ditto "	"	1½
Ditto "	"	1½
Ditto "	"	2
Ditto "	"	1½
Total deficiency in six half-quarterns		8½

It is commonly said, that thirteen make a baker's dozen; it is clear that bakers not in general reckon the weight of the loaves they vend by this scale. ousekeepers! we advise you to put your scales in order.

The following letter relating to the short weight of bread, and showing the anner in which the evil may be met, is of much importance.

SHORT WEIGHT.

To the Editor of The Lancet.

Sir, — In your admirable exposures of the nefarious practices of bakers in eir trade, I observe you do not limit your investigations to adulteration, but ow up the equally dishonest system they follow of mulcting the public in the derstood weight of their bread. The Act of Parliament professing to check is latter fraud, in practice is a dead letter, as it places the onus of checkg the baker on the purchaser, and imposes a trouble which in ninety-nine ses out of a hundred the public will not take.

I write this to acquaint you with a plan which is in every way a most effectual eck to dishonesty in the weight of bread; and, as it has been enforced for about ree years in this city by law, its practical efficiency for the purpose has been lly established.

The plan is simply to make it imperative on the bakers to stamp the weight upon all the loaves he makes. The provision to this effect in the Police Act of Edinburgh is twofold. It enacts: 1st., That every loaf of bread shall have impressed upon its upper surface the imperial weight in legible figures and letters; 2nd, That the vendor of any loaf not so stamped shall, if stamped with a false or unjust denomination of weight, be liable to a penalty of, I think, *5l.*, and if unstamped he shall be liable to a like penalty, and the forfeiture of the bread. Fancy bread is exempt from this law.

I am happy to say, as the originator of this provision, that it has worked most satisfactorily, both for the fair dealer and the public, since it came into operation in Edinburgh. While it makes the baker or vendor of bread responsible for the weight of his loaves, it imposes no extra trouble or other restriction on him in his business. It merely makes him do what every other tradesman does —that is, vend his commodity by weight, and not by lump, as is virtually the way everywhere except in Edinburgh.

If these observations, on a very important matter as regards the interests of the poor*, who are the parties most imposed upon by the short-weight bakers, be thought worthy of publication in your patriotic pages, I shall be very glad.

I am, Sir, your obedient servant,
JAMES S. TORROSS.

COFFEE, AND ITS ADULTERATIONS.

[SECOND REPORT.†]

IN the first Report on Coffee and its Adulterations, published in THE LANCET of the 4th of January, we stated that, after the expiration of the three months' notice which we then gave, it was our intention to publish, with the analysis of each sample, the name of the dealer of whom it was purchased, and this whether the coffee on examination was found to be genuine or adulterated.

The time has now arrived for acting up to this declaration. We are fully aware that in following this course we incur immense responsibilty, which the great objects we have in view—viz., the protection of the public health and of the honest trader, alone induce us to undertake.

We know that we expose ourselves to abuse, threats, legal proceedings, and to a misconstruction and misrepresentation of our motives and intentions; but, strong in our cause, we will not allow these considerations to deter us from fearlessly pursuing the course we deem necessary to effect our objects; and we feel assured that, in honestly discharging our duty, we shall secure the approval of the profession, the support of the press, and the thanks of the public.

We believe that the publication of the names of parties who sell adulterated articles is imperatively necessary, and that there is no other way equally efficacious by which the scandalous adulterations now so generally practised upon our food and drink can be kept in check.

Were we simply to describe the various adulterations resorted to, and not at the same time make known the names of the parties who are responsible for them, we believe that we should be doing more harm than good, and that, in place of serving the public, and remedying the evil, we should but extend and perpetuate it, by making known facts in reference to adulterations, of which the dishonest would not be slow to avail themselves.

The publication of Accum's researches, some years since, as well as of other more recent works, treating of the falsifications of food, have clearly been followed by increased adulteration.

So long as the Reports of the Analytical Sanitary Commission continue, (and we do not intend that they shall be brought to a speedy conclusion,) no fear need be entertained that any such result shall be permitted to ensue from its labo

We propose to pass in review successively every article of food and dr retracing our steps from time to time, and returning, as we do now, in the

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[*] The penny loaf, previous to the experiment of the stamping of bread, was never less than from three ounces deficient in its regular weight; or, in other words, the baker took about two bites loaf before he handed it to the poor man. He is ashamed to do so now, as his "abstraction" stares the face in legible characters when he hands over the loaf.

[†] April 26th, 1851.

coffee, to the consideration of articles which have already attracted our atten- n. In this way, visiting town and city, we shall perform the part of a vigilant nitary Police.

We believe that while we shall thus be promoting the interests of the public, d of the honest trader, we shall, in many instances, render an important rvice to those tradesmen, the commodities vended by whom are not in all cases und, on examination, to be genuine; because we know that, not unfrequently, ey are themselves the victims of systematic adulterations practised by the anufacturers.

In the case of the adulteration of coffee there are clearly three parties amongst hom the blame must be shared.

First. The Lords of the Treasury, by suspending for so many years the peration of an Act of Parliament through the Treasury minute of 1840, where- y the adulteration of coffee with chicory is legalised, are very greatly to blame.

Second. Since the adulteration of coffee with beans, roasted corn, and sub- tances other than chicory, is almost exclusively practised by manufacturers of hicory-powder, the conduct of these parties is, in many instances, highly ulpable.

Lastly. Those retail grocers are much to blame who not merely adulterate offee with chicory, but who purchase an article in the state of powder declared o be chicory, although they are well aware, from the price at which it is offered, s well as from other circumstances, that it is not genuine chicory-powder, but compound specially prepared for the adulteration of coffee.

That the reports of the Analytical Sanitary Commission have already effected much good it would be easy to prove.

Our inquiries and disclosures have been the means of calling the attention of he public and of Parliament to the subject of the adulteration of food, the moral, sanitary, and pecuniary bearings of which have been much discussed.

To take the article coffee. We have already shown the nature of the adulterations, and the extent to which they are practised.

We have likewise shown, that for many of the adulterations discovered, manufacturers of chicory-powder are responsible, and also in what manner, and to hat extent, the retail dealer is culpable.

We know that many grocers, in consequence of the exposures made, have bandoned the use of chicory, it becoming evident to them that, with due regard o their own characters, they could not continue mixing it with coffee, and afterwards to sell this compound as genuine coffee.

Others, again, have adopted a middle course, and now sell the genuine and he mixed or adulterated articles separately, professing to inquire of each purchaser which he prefers.

Although this proceeding is undoubtedly a step in the right direction, it is not all that is required, and we hold that in no case ought traders to sell the compound article. Chicory and coffee should be kept perfectly distinct, and sold separately under their own names; the purchaser, should he be unwise enough to prefer the mixture to genuine coffee, himself mixing the ingredients n such proportions as he thinks fit.

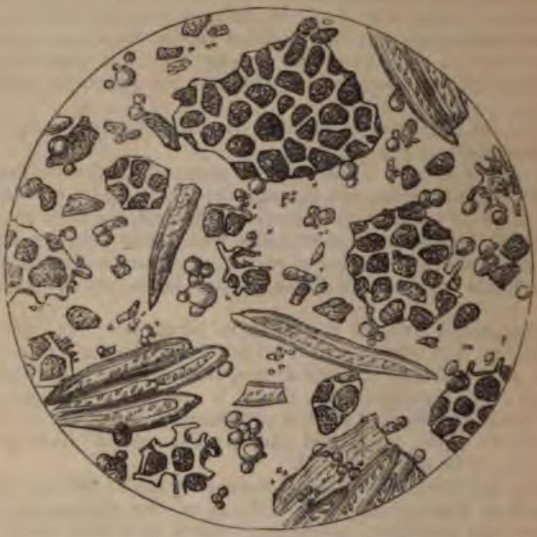
So long as the grocer can sell chicory under the name of coffee, and secure three times the profit which he is able to obtain from the sale of genuine coffee, it is clearly his interest to discourage the use of the genuine and promote that of the spurious article. This object it is quite possible for a dishonest trader to effect by selling *inferior* although *genuine* ground coffee, and thus bring discredit upon the pure commodity and injure its character in the estimation of the public.

We shall show also, hereafter, that in some cases the manufacturers have taken alarm, and have, for the present, ceased to adulterate the chicory-powder which they supply.

In the Reports on Coffee and Chicory, which have already appeared, we described minutely the structure of the coffee-berry and chicory root, and gave illustrative engravings. We now publish additional ones, exhibiting the characters and appearances presented by coffee examined under the microscope when adulterated with chicory, roasted corn, beans, &c.

Fig. 60.

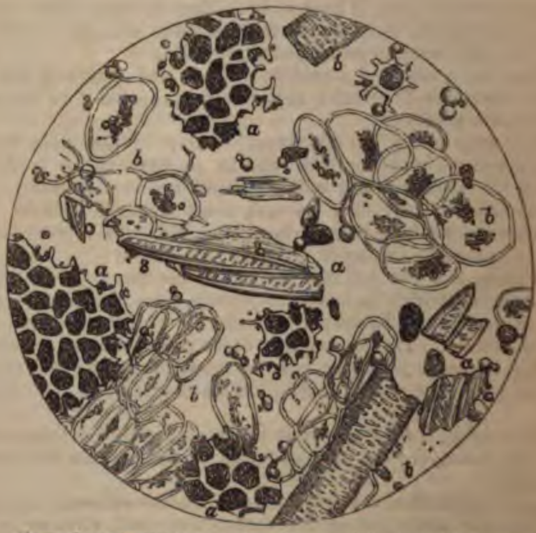
a = coffee



This engraving exhibits the structure and characters of *genuine ground* COFFEE.

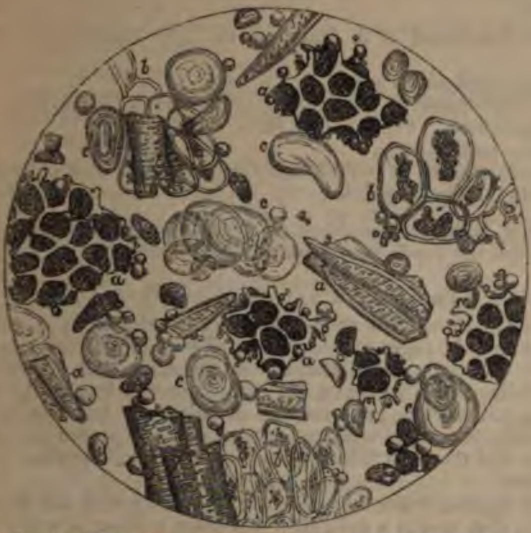
Fig. 61.

= coffee .
= chicory



Shows the structures in a sample of COFFEE *adulterated with* CHICORY.

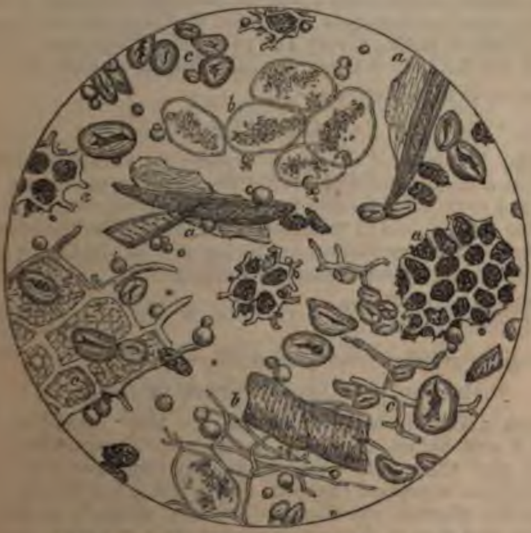
Fig. 62.



Sample of *Coffee adulterated with both* CHICORY *and roasted* WHEAT.

a = coffee
b = chicory
c = wheat

Fig. 63.



Coffee adulterated with both CHICORY *and roasted* BEANS.

a = coffee
b = chicory
c = bean

On an attentive examination of the preceding figures it will be apparent even the ordinary and unscientific observer how remarkably coffee, chicory, wheat, d beans, differ from each other in structure, and how valuable and satisfactory the means of discrimination furnished by the microscope.

Results of the Examination of Forty-two Samples of Coffee p chased at the Establishments of different Grocers resident in t Metropolis.

1st *Sample.*—Purchased of J. Butterworth, 110. Shoreditch. Price 1*s.* per lb.

Adulterated—with chicory.

2nd *Sample.*—Purchased of D. Punnett, "Punnett's Coffee-Pot," 129. Hig street, Shoreditch. Price 1*s.* per lb.

Adulterated—with chicory.

3rd *Sample.*—Purchased at "Tulloch's Great Tea and Coffee Exchange," Shoreditch. Price 1*s.* per lb.

The following is a *verbatim* copy of a bill issued by Messrs. Tulloch Co., and in which the goods purchased at their establishment were enclosed

"The Coffee and Chicory Agitation.

"At the present time, when the public mind is agitated by all the conceiva contrivances which the ingenuity of interested men and selfish motives can s gest, we deem it proper to call attention to the FACT, that we have always clared our readiness to GRIND OUR COFFEE under the immediate inspection those of our customers who are tenacious of chicory. And now to demonstr and give publicity to our *fair-dealing system*, we have placed *one of our mills the window*, so that the most incredulous cannot but feel satisfied that they ha a genuine article.

"We do not deprecate the moderate use of chicory with the finer descripti of coffee, as by that means a delightful beverage is brought within the reach the poorer classes; but we do *condemn* the fallacious conduct of those wh under pretence of selling pure coffee, charge an exorbitant price, when, reality, they vend an article adulterated to an extent never thought of by th less bombastic neighbours. Still we acknowledge that the people of this cou try have a right to expect a supply of genuine coffee, if they pay a price whi will yield the retailer a fair profit; and we therefore invite all to our establis ment, pledging ourselves to supply them with a wholesome beverage.

"Observe! Tulloch & Co., Great Tea and Coffee Exchange, 171. Shoredit 100 yards from the Railway Station, towards Shoreditch Church."

A second notice is thus worded:—

"COFFEES.

"The popular beverage of the day is Coffee; its cheapness invites gene attention, and as a luxury rich and poor alike concur in esteeming it. It is u versally admitted to be an agreeable as well as an invigorating and refreshi stimulant. The Coffee sold at this establishment will be found to possess, the highest degree, the pure mellow properties peculiar to Coffee in its genu state; a trial will prove its unsurpassed excellencies.

Good Sound Coffee - - -	- 1*s.* 0*d.*
Choice Ceylon Coffee - -	- 1*s.* 4*d.*"

The following is extracted from a third bill:—

"Method of Making Coffee in Dominica.

"The French always make use of Coffee for their breakfast, taking eq quantities of it and boiled milk, (or, more properly speaking, milk that scalded;) and after their dinner they commonly drink a cup of coffee, with milk; and they have in general excellent health and a fine flow of spirits for t part of the world; whereas the English subjects, whom it is difficult to w from prejudices, and though they enjoy a good state of health, do not appear have half the vivacity or liveliness with the French in the same island with u

Accompanying this quotation was a wood-cut, representing, in the centre group of "Coffee-merchants encamped for the night," surrounded by reclin Turks and others, enjoying the luxuries of hookhas and coffee.

Adulterated—with a large quantity of chicory; cold infusion highly and naturally coloured.

th Sample.—Purchased of Phillips & Co., 8. King William-street, City. Price 1*s*. 4*d*. per pound.

Adulterated — with chicory.

th Sample. — Purchased of Sidney, Wells, & Manuell, Tea-dealers, 8. Ludgate-hill. 1*s*. 4*d*. per pound.

Adulterated — with chicory.

th Sample. — Purchased of Dakin & Company, Tea-merchants, No. 1. St. Paul's Churchyard. 1*s*. 4*d*. per pound.

Adulterated — with chicory.

In advertisements recently published in the daily papers, Messrs. Dakin & Co. announced that they now adopt the system of selling genuine ground coffee, nd also mixtures of chicory and coffee, to be obtained at the option of purchasers. We are still of opinion that the two articles ought, in all cases, to be old separately.

Since the appearance of these advertisements, we have made two purchases at the establishment of Messrs. Dakin & Co. On the first occasion, on asking for a bottle of coffee, the question was put to us whether we desired to have it pure, or mixed with chicory? on the second, no inquiry was made; coffee was asked for, and this, on examination, was found to contain *chicory*.

Thinking it possible that the sample of adulterated coffee above referred to might have been served by mistake, we have made (since the preceding was in type) a third purchase, and found this sample to be likewise adulterated with chicory.

The following extracts are taken from a prospectus issued by Messrs. Dakin; copy of which we obtained at their establishment a few days since. (April, 851.)

"*In order to insure to consumers the certainty of using only pure Coffee,* Dakin & Co. *recommend Purchasers to buy their Coffee whole, and to grind it hemselves. With the view of affording every facility for so doing,* Dakin & Co. *ontinue to supply an excellent cast-iron Coffee-mill, complete, with adjusting crew and enamelled drawer, for the cost-price, namely,* 3*s*. 9*d*."

We suggest to Messrs. Dakin, whether it would not be an equally effectual ay to "*insure to consumers the certainty of using only pure coffee,*" if they ere to supply, not only "*excellent cast-iron coffee-mills,*" but also the ground offee-berry itself in the genuine state.

th Sample. — Purchased of Holland & Co., 78. Lamb's Conduit-street, "For the Sale of the Finest Teas and Coffee at Reduced Prices." Price 1*s*. per pound.

"PLANTATION COFFEE,
FULL FLAVOUR. 1*s*. per pound."

Adulterated — with chicory.

h Sample. — Purchased of Hawthorn & Co., 74. High Holborn. Price 1*s*. per pound.

The following bill, printed in red type, and in conspicuous characters, we py *verbatim*:—

"COFFEE FOR THE MILLION.
THE COLOSSAL MILLS.
Hawthorn & Company
are the
Sole Proprietors
of the
UNIVERSALLY CELEBRATED
and
Incomparable
EUROPEAN
COFFEE,
ONE
SHILLING
PER POUND.

CAUTION.

THIS EXTRAORDINARY COFFEE having attained such an UNPRECEDENTED CELEBRITY, has induced many firms to assure the public that they can supply th same. Hawthorn & Co. beg to state that this UNIVERSALLY CELEBRATED COFFE is not CONSIGNED to ANY OTHER HOUSE either IN or OUT of the metropolis; consequently NONE is GENUINE unless obtained from Hawthorn & Co.'s Tea, Coffee, and Colonial Warehouses,

74. HIGH HOLBORN."

A second handbill is as follows: —

"PRODIGIOUS
and
UNPRECEDENTED SALE
of
COFFEES.

"The following copy of a letter received from Messrs. SAVAGE & Company, the mill founders, who constructed our vast and colossal apparatus for pulverising coffee, will convey some idea of the enormous quantity sold at our establishment:

'April 2nd. 18

'GENTLEMEN, — Providing three mills the size of those large ones constructed by us for you, are moved by sufficient power, and kept in good condition, we ar of opinion that they will grind five tons five cwt. of coffee per day of fourtee hours, or 11,760 pounds of coffee per day; 840 pounds of coffee per hour, fourteen pounds of coffee per minute.

'We are, gentlemen, yours respectfully,
SAVAGE & Co.

'To Messrs. Hawthorn & Company, 74. High Holborn.'

"Though this Powerful Grinding Apparatus is kept in constant operation, HAWTHORN & COMPANY find it

UTTERLY IMPOSSIBLE
to get
SUFFICIENT COFFEE GROUND
on
SATURDAYS;

They therefore earnestly request their friends to forward their orders as early i the week as possible, and beg to state that all orders given on the Saturday exceeding three pounds will be forwarded to any part of the metropolis or vicinity by twelve o'clock on Monday morning.

HAWTHORN & COMPANY,
THE HOLBORN COFFEE MERCHANTS,
Importers of Tea and Colonial Produce.
N.B.—THE INCOMPARABLE EUROPEAN COFFEE,
ONE SHILLING PER POUND,
can only be obtained at
OUR TEA, COFFEE, & COLONIAL WAREHOUSES,
74. HIGH HOLBORN,
THE HOLBORN COLOSSAL MILLS.

"*The immense Rush of Customers, and the long-continued influx of Busines* wholesale and retail, has compelled us entirely to *reconstruct* and very greatly enlarge our premises, which are now *the most spacious and splendid in this part of the metropolis,* and in every respect adapted for our immense and still rapidly increasing business, affording every convenience and comfort to purchasers."

A third and more recent placard is thus printed: —

"A Cup of
STRONG COFFEE

is the ONLY LUXURY I indulge in; I ran half over LONDON, but could n obtain any, till one day an old lady-friend of mine stopped me and said 'You wear out a deal of shoe-leather unnecessarily; just call in at

HAWTHORN'S,
The eminent Holborn Coffee Merchants,
74. High Holborn,
and get some of their
EXTRAORDINARY
EUROPEAN COFFEE,
One Shilling per Pound,

will never drink any other.' I DID so, and must say that it is the
EST AND MOST DELICIOUS COFFEE I ever tasted."

terated—with very much chicory, which forms the principal part of the
icle; infusion deeply and unnaturally coloured.

nple.—Purchased of Underwood & Co., 54. Long-acre. Price 1*s.* per
ınd.

terated—with a considerable quantity of chicory, which forms not less
n one-third of the sample.

mple.—Purchased of James Appleton, 174. Drury-lane. 1*s.* per pound.
"Rich flavoured Coffees fresh roasted daily.

USE OF COFFEE IN TURKEY.

ndys, the translator of Ovid's 'Metamorphoses,' and who travelled in
in 1610, gives the following passage in his 'Travailes,' page 51. (edit.
Speaking of the Turks, he says:—'Although they be destitute of
, yet have they their coffee-houses, which something resemble them.
sit they chatting most of the day, and sip of a drink called coffa, of the
hat it is made of, in little china dishes, as hot as they can suffer it, black
, which helpeth, as they say, digestion, and procureth alacrity.'"

lterated—with chicory, of which not less than half the sample consists.

mple.—Purchased of W. & G. Law, Coffee Merchants to the Queen,
4. New Oxford-street. Price 1*s.* 4*d.* per pound.
lterated—with chicory.

ng been informed, since the above was in type, that Messrs. Law had just
l the system of selling genuine ground coffee, and also coffee adulterated
icory, to be procured at the option of the purchaser, we obtained another
sold as coffee, which we found on examination to contain *chicory.*
bill, exhibited in the windows of their establishment, we noticed the fol-
sentence, which occurs after the enumeration of a variety of coffees, with
rices—

be had in any quantity, Raw or Roasted, Whole or Ground, and genuine
d, according to taste."

ample.—Purchased of Henry Sparrow & Co., 371. Oxford-street.
ce 1*s.* per pound.

"STRONG AND FULL FLAVOURED COFFEE, 1*s.* per pound,
Roasted on the same principle as
SPARROW'S CONTINENTAL COFFEE,
hereby the STRONG AROMATIC FLAVOUR IS PRESERVED, which in the
ordinary process of roasting is entirely destroyed.

Also by ROYAL LETTERS Patent, Sparrow's CONTINENTAL
Coffee Pot,

Sold Wholesale and Retail by
HENRY SPARROW & COMPANY,
Patentees and Sole Proprietors of the
CELEBRATED CONTINENTAL COFFEE,
371. Oxford-street."

terated—with chicory.

mple.—Purchased of Houle & Co., 282. Oxford-street. Price 1*s.* 4*d.*
pound.

terated—with chicory, which forms nearly one-half the sample; cold in-
ion unnaturally coloured.

14th Sample.—Purchased of W. R. Turner, 267. Oxford-street. Price 1*s.* per pound.

Adulterated—containing very little coffee, but consisting principally of chicory.

15th Sample.—Purchased of J. M. Guest, 218. Oxford-street. 1*s.* per pound.

Adulterated—with a considerable quantity of chicory, and a vegetable substance, closely resembling horse-chesnut.

We have on several occasions purchased of Mr. Guest samples of both coffee and chicory; and have invariably found the coffee to be adulterated both with chicory and the vegetable substance above referred to, and the chicory with the latter only. Of this adulteration no doubt Mr. Guest was ignorant, and that it existed in the chicory powder as purchased.

16th Sample.—Purchased of A. C. Strugnell & Co., 221. Oxford-street. 1*s.* per pound.

Adulterated—with a considerable quantity of chicory.

17th Sample.—Purchased of Pembridge & Hunt, 107. Tottenham-court-road. 1*s.* per pound.

Adulterated—containing a very considerable quantity of chicory.

18th Sample.—Purchased of Mr. Bousefield, 111. Tottenham-court-road. 1*s.* per pound.

Adulterated—containing very little coffee, the chief ingredient being chicory, the quantity of which is so considerable as to cause the article to cohere into a firm mass. Cold infusion highly and unnaturally coloured.

19th Sample.—Purchased of G. Clarke, Tea and Coffee Merchant, 135. Tottenham-court-road. 1*s.* per pound.

"COFFEE,

"The richest and most grateful beverage we possess, holds an important place in domestic economy, and has peculiar claims on the part of consumers to obtain it pure, wholesome, and free from the vicious acids generated by improper roasting.

"The many tedious and expensive processes that have been introduced have alike proved themselves failures, and the true secret remains, that no improvement has been made on the ORIGINAL METHOD of roasting when conducted with proper care and attention. Our coffees are roasted with every possible care and economy; and with the advantages of our long experience as practical coffee-roasters, we are able to bring out and preserve its delicious qualities, particularly the rich aromatic flavour.

"In preparing for the table, coffee is prepared with or without boiling, according to taste; but all agree that to have COFFEE IN PERFECTION, it must be made QUICKLY, and served up HOT, STRONG, and CLEAR.

"THOROUGH GOOD AND USEFUL COFFEE, WHICH NEVER FAILS TO GIVE SATISFACTION - - } 1*s.* 0*d.* & 1*s.* 2*d.*

CLARKE'S
TEA AND COFFEE WAREHOUSE,
135. TOTTENHAM-COURT-ROAD."

Adulterated—containing very little coffee, the greater part consisting of chicory.

20th Sample.—Purchased of Waller & Co., 80. Charlotte-street, Tottenham-court-road. 1*s.* per pound.

Adulterated—containing very little coffee, chiefly chicory.

21st Sample.—Purchased of H. M. Beckett, 23. Devonshire-street, Lisson-grove. 1*s.* per pound.

Adulterated—with chicory.

22nd Sample.—Purchased of Wm. Harper, 24. James-street, Lisson-grove. 1*s.* 4*d.* per pound.

Adulterated—with chicory.

23rd Sample.—Purchased of Mr. Green, 45. New Church-street, Edgware-road. 1*s.* per pound.

Adulterated—with a considerable quantity of chicory.

th *Sample.*—Purchased of T. Edmunds, 49. Seymour-place, Bryanston-square. 1*s.* per pound.

Adulterated—the greater part of the sample consists of chicory; infusion deeply and unnaturally coloured.

th *Sample.*—Purchased of Nicholas Hall, 135. Edgware-road. 1*s.* per pound.

"QUALITY THE TEST OF CHEAPNESS.
Finest old Java or Plantation, 1*s.* per pound."

Adulterated—principal ingredient chicory.

th *Sample.*—Purchased of F. W. Strugnell, Edgware-road. 1*s.* per pound.

Adulterated—with a very considerable quantity of chicory.

th *Sample.*—Purchased of Bodley & Co., Edgware-road. 1*s.* per. pound.

Adulterated—very little coffee; chief ingredient chicory; infusion deeply and unnaturally coloured.

th *Sample.*—Purchased of W. J. Martin, 147. Edgware-road. 1*s.* per pound.

Adulterated—with much chicory.

th *Sample.*—Purchased of Westbrook & Co., 21. Oxford-street. Price 1*s.* 4*d.* per pound.

Adulterated—with chicory.

The purchaser was assured that this article contained no chicory, and was erfectly genuine.

th *Sample.*—Purchased of C. Belchem, 120. Drury-lane. Price 1*s.* per pound.

Seeing the following notice in the window, printed in large characters, we ked to be supplied with the article referred to therein:—

"By Appointment.
PATENT DESICCATED COFFEE,
And no Chicoree,
Daily roasted by the Company's
Approved Principle.
1*s.* per pound.
Strongly recommended."

A written placard was also placed in the shop entrance, which ran as fol ows:—

"Noted pure and fresh-roasted
COFFEES,
1*s.* per pound,
Warranted a Genuine Article."

Adulterated—with chicory, and containing numerous fragments of some amorphous substance.

Sample.—Purchased of James Robinson, 156. Bishopsgate-street Without. Price 1*s.* 4*d.* per pound.

The following is a copy of a written placard, of gigantic proportions, placed ar the shop-door:—

"GENUINE COFFEE.
No adulteration.

"We conceive that it is our duty to caution our friends and the public against e present unjust and iniquitous system pursued by many grocers in adultering their coffee with

Roasted beans,
Dog biscuit,
Chicory, and tan.

"Our advice to purchasers of coffee is, to buy it in the berry, and grind it rselves; if you cannot do this, purchase it of respectable men only; pay a nd honourable price for it; you may then depend upon a GOOD and GENUINE e."

lterated—with a very large quantity of chicory.

ur first report on coffee, out of between thirty and forty samples of that purchased at apparently reputable establishments, but two were found to dulterated, those having been procured of Mr. J. F. Betts, 262. Oxford-and Messrs. Knight and Son, 83. Gracechurch-street, City.

then expressed a hope that there were hundreds of dealers who, like Mr.

Betts and Messrs. Knight and Son, were sellers of genuine coffee, and equally entitled to the respect and confidence of the public.

On this occasion we have the satisfaction of making known the nam tradesmen, who, amidst considerable temptation, and under disadvant been ascertained to be conducting their business in a fair and uprig and to be selling under the name of coffee the genuine commodity,

The samples of coffee obtained at the following establishments analysed, and found to be perfectly genuine: —

Messrs. RIDGWAY & Co.,
4 & 5. King William-street,
City.

Mr. HENRY SHARPE,
44. Bishopsgate-street Within,
City.

Mr. E. DEANE,
4 & 5. Shoreditch, High-street.

Messrs. KNIGHT & Son,
83. Gracechurch-street,
City.
(*Second Trial.*)

Messrs. FORTNUM & MASON,
181. Piccadilly.

Messrs. J. BRANSCOMBE & Co.,
88. Pall-Mall.

Messrs. DANN, JOHNSTON, & Co.,
84. New Bond-street.

Messrs. G. PAYNE & Sons,
328. Regent-street.

Mr. J. F. BETTS,
262. Oxford-street.
(*Second Trial.*)

Mr. STANIFORTH,
138. Oxford-street.

Mr. W. HOLLAND,
127. Oxford-street.

From an examination of the Table of Analyses in this Report, it ap

1st. That out of the forty-two samples of coffee submitted to analy *were unadulterated.*

2nd. That *the remaining thirty-one samples were all adulterated wit* which was met with in every proportion, it in many cases constit chief part of the article.

3rd. That *in two cases only was any other adulteration than that wi observed,* — one consisting of a vegetable substance resembling horse and the other, of some amorphous substance, probably used for col burnt sugar.

Many of the samples, purporting to be coffee, and sold at 1*s.* and lb., consisted principally of chicory.

We have compared several of these with the mixture of chicory sold by Dakin and Co. at 8*d.* per lb., and this we have in many cases contain the largest proportion of coffee.

We mention this circumstance, because it serves to show the exten

c is defrauded through the vicious system of selling a spurious article
e name of the genuine commodity.

first Report on Coffee we gave two Tables of Analyses. From an
tion of the first table, it appeared —

hat the *thirty-four coffees, with three exceptions, were adulterated.*
That *chicory was present in thirty-one instances.*
Roasted corn in twelve.
Beans and potato-flour, each in one case.
hat *in sixteen cases the adulteration consisted of chicory only.*
hat *in the remaining fifteen samples the adulteration consisted of chicory,*
er roasted corn, beans, or potatoes.
hat *in many instances the quantity of coffee present was very small;*
thers, it formed one fifth, fourth, third, half, and so on, of the whole

esults of the analyses of the twenty samples contained in the second
re as follow: —

hat *eighteen out of the twenty samples were adulterated with chicory.*
That *four of the samples contained roasted corn in addition to chicory.*

asting the results obtained from the more recent, with those of the
nalyses, it appears, that while the adulteration of coffee with chicory
undergone any diminution, that with roasted corn, beans, &c., has
clined. This satisfactory result we believe to be mainly attributable to
sures which we have made, and which have done more to check the
tion of food than has the whole and very costly machinery employed
purpose by the Excise authorities.

e increased adulteration of coffee with chicory (which ingredient, in
takes the place, to a considerable extent, of coffee), we have to thank
aceful policy pursued by the Lords of the Treasury, with the sanction
harles Wood, in legalising this adulteration.

ader, in the course of the perusal of the notices and hand-bills, of
have inserted copies, cannot fail to have observed the exaggerations,
tions, and untruths, contained in many of them. In our opinion, these
show great want of principle, and exhibit a very unsound state of

course of our observations, we have made repeated reference to a cer-
reasury Order." Many of our readers will be curious to learn in what
order sanctioning adulteration and fraud could possibly be couched
appearance of propriety. The following is a copy of it: —

"GENERAL ORDER.

Excise-Office, London, August 31st, 1840.

suance of directions from the Right Honourable the Lords Commis-
f Her Majesty's Treasury, signified by Mr. Gordon's letters of the 6th
instant,

ed, — That no objections be made on the part of the Revenue to dealers
rs of coffee mixing chicory with coffee, or to their having the same so
their premises.

By the Board,
(Signed) CHARLES BROWN."

moralising nature of this document it is unnecessary to dwell upon;
een appropriately termed, "An Order to enable Coffee-dealers to
the public, especially the Working Classes, and the Revenue of vast
money."

THE ANALYTICAL SANITARY COMMISSION.

To the Editor of THE LANCET.

We have obtained a copy of your last issue of THE LANCET, and on
ver your Report on "Coffee and its Adulterations" find ourselves re-
nd appealed to. After alluding to the advertisements that we have

[illegible] issued in which we state our intention of selling pure ground coffe to purchasers expressing a wish to obtain pure ground coffee, and coffee a [illegible] desiring coffee and chicory mixed, you mention th [illegible] purchases to be made at our establishment, and that the first [illegible], in requesting a bottle of coffee, you were asked wheth [illegible] pure, or mixed with chicory. The result of this purchase y [illegible] have been more satisfactory had you d [illegible] proceed: "On the second no inquiry was ma [illegible] examination, was found to contain chicory."

[illegible] — This it is possible that the sample of adulterated coffee ab [illegible] have been served by mistake, we have made (since [illegible] a third purchase, and found the sample to be li [illegible] adulterated with chicory."

We [illegible] defend the negligence of the young man who served you, w [illegible] instructions, omitted in any instance to ask a p [illegible] whether he desired pure coffee, or coffee and chicory mixed.

When we consider that nine out of every ten who purchase ground co [illegible] to have it mixed with chicory, and that the remaining one-tenth e [illegible] pure coffee by asking for pure coffee, we really think that y purchaser did not, after our advertisements, express himself fairly by si asking for coffee, when in a previous instance he had been taught that asking for pure coffee, pure coffee only was supplied.

The great majority of purchasers of ground coffee wish to buy it mixed w chicory, and whilst we maintain that their wishes ought to be respected, [illegible] like respect to the wishes of all our customers, but we do not co that we are asking too much of those who wish for pure coffee, when we [illegible] them to ask for it pure: precisely in the same way as purchase tea ask for black, green, or mixed tea, as they require it.

We have ordered, and have been disappointed in not yet receiving, s receivers similar to those that we have in use, in order to have reg assorted pure coffee at different prices, as well as coffee mixed with chi at different prices: each receiver will have the contents legibly marked the and a request legibly printed is now being prepared for sticking up i shop, that purchasers wishing pure coffee will ask for pure coffee. The ties of pure coffee are all marked pure coffee, and so we hope, by the a arrangements, disappointment will be prevented, and all purchasers at establishment will be served in accordance with the wish of its propri by having the article supplied to them that they wish to purchase, and either; and we beg to inform you that this is no new subject forced up by your strictures, for we can refer to our advertisements several years in which we urged customers wishing for pure coffee, to purchase it i berry instead of ground.

We are, gentlemen, your obedient servants,

DAKIN & COMPANY.

St. Paul's Churchyard, May, [illegible]

** Messrs. Dakin and Company will perceive that in our report on C Coffee, contained in THE LANCET of last week, we published the analysis o bottle of coffee referred to in their communication, and stated that it was to be *unadulterated*. The Messrs. Dakin appear to consider it incumbe every purchaser desiring to obtain coffee, to state specifically that he requi to be "pure" or "genuine," and that it is not sufficient that he asks simply coffee. To this proposition we entirely demur, and are of opinion that customer inquiring for COFFEE has a right to expect that he receives the a which he demands. In buying tea and sugar, it is not usual to ask for " or "*genuine*" tea, or "*genuine*" sugar; neither is it customary, in send the wine merchant for a dozen of port to instruct the messenger to ask "pure" port, nor does the purchaser expect that he will obtain a mixtu *tent* and port, or *cider* and port. We altogether deny the accuracy of the tion that "nine out of every ten who purchase ground coffee '*desire*' to it mixed with chicory."

ER COFFEE, AND ITS ADULTERATIONS.

l report on Coffee, published in The Lancet of Saturday, Apr
enumerating the establishments at which genuine ground coffee
we omitted to give the prices of the several samples examined.
ensate for that omission.

	Per pound. s.	d.		Per pound. s.	d.
vay & Co. -	1	4	Messrs. Dunn, Johnston, & Co.	1	4
iarpe - -	1	4	Messrs. G. Payne & Sons -	1	4
- -	1	4	Mr. J. F. Betts - -	1	4
at & Son -	1	8	Mr. Staniforth - - -	1	4
um & Mason -	1	4	Mr. W. Holland - -	1	4
anscome & Co. -	1	4			

be seen that genuine ground coffee may be purchased at a very
e; this fact contradicting, in the most conclusive manner, the
equently made, that if chicory ceased to be mixed with coffee, the
ould only be procurable at 2*s.*, and the better sorts at even 3*s.* per

rt inserted in The Lancet on the 4th of January last, we expressed
t CANISTER COFFEE was more adulterated than other coffee; this
unded on the fact that it is commonly sold at the same price as
lthough the cost of each canister is not less than from twopence to
We now propose to ascertain how far our then-expressed con-
ained by analysis.

THE MICROSCOPICAL EXAMINATION OF TWENTY-NINE SAMPLES OF
OCURED AT THE ESTABLISHMENTS OF VARIOUS TEA DEALERS AND
ESIDENT IN THE METROPOLIS, AND CONTAINED IN SEALED PACK-
LES, AND CANISTERS.

– Purchased of John Cassell, 80. Fenchurch-street, half-pound
Price 8*d.*

"JOHN CASSELL'S COFFEE,

hness, flavour, and strength of which are not to be surpassed.

as now become an article of consumption amongst all classes of
y. Hence the importance of supplying an article of such a cha-
ncourage its consumption in preference to beverages, the use of
es a vast amount of misery.

SELL'S COFFEE meets the requirement of the age, and, as a natural
lebrity to which it has attained is wholly unparalleled. Its pecu-
s in its possessing that rich aromatic flavour, combined with great
deliciousness, which is to be found alone in the choicest mountain
may with perfect truth be stated, that no article connected with
omy has given such general satisfaction, and the demand for it is
sing.

SSELL'S Establishment, both for extent and capability, is the first in

OBSERVE.

nister of JOHN CASSELL'S COFFEE bears his signature, without
s genuine. Thus,

John Cassell."

d — with a considerable quantity of chicory.

— Purchased of John Cassell, 80. Fenchurch-street. In paper and
kage. Price 1*s.* 4*d.* per pound

' *Coffee*

come an article of consumption amongst all classes of the com-
nce the importance of keeping up a supply adequate to the in-
and, and also of taking care that the article supplied is of such a

character as to encourage its consumption in preference to beverages, the u which produces a vast amount of misery.

"*John Cassell's Coffee* meets the requirement of the age, and the dail creasing demand for it from all parts of the kingdom demonstrates that it only to be once introduced to be highly appreciated."

Adulterated—with a considerable quantity of chicory.

3rd Sample.—Purchased of Abbiss & Company, 60. Gracechurch-street.

"ABBISS & COMPANY'S
Celebrated
Patent Desiccated
Coffee
for
One Shilling."

It will be remembered that the Chancellor of the Exchequer, when he bro forward his first budget, in the course of an attempted defence of the ad ration of coffee with chicory, made the following remarks:—

"I hold in my hand a circular from a firm in the City, who say, what ent agrees with what I have heard from other parties, that they have found a crease in the coffee trade in consequence of the admixture with that artic the 'wholesome and nutritive' root, chicory, &c."

This firm, we have reason to believe, is none other than that of Abbiss & from whose circular we now make a few brief extracts:—

"Why, then, should we continue to decline the use of chicory? The p taste demanded it, the legislature sanctioned or permitted it; we had no reas think that chicory was deleterious, but, on the contrary, possessed tonic qual and was decidedly WHOLESOME and NUTRITIVE. These reflections grad brought us to the determination to *gratify the public taste*, and we found th IMMENSE INCREASE IN OUR COFFEE TRADE WAS THE RESULT; thus demonstrat beyond the slightest doubt, that coffee, with an admixture of GENUINE CHIC (which we take care to procure by purchasing the article in its raw state, having it roasted the same as coffee), was preferred to coffee in its pure sta

Here, then, we appear to have the authority upon which the Chancell the Exchequer made his very notorious and equally erroneous statements— that chicory root is wholesome and nutritive; and second, that its use occa an "immense increase in the coffee trade." Let us now see how far Me Abbiss & Co. act up to their own published statements.

In effecting the purchase of the canister of coffee, no intimation was ma us that it contained chicory. On referring to the circular already noticed, h ever, we observed the following:—

"* A canister containing one pound of good Family Coffee, ONE SHILL

"*The Coffees against which this mark is placed are mixed with that propo of Chicory which, from the experience of several years, we have found t satisfaction to the Public."

Adulterated—with a considerable quantity of chicory, and some roasted farina.

4th Sample.—Purchased of J. D. Browning, 4. Gracechurch-street. I 1*s.* 6*d.* per pound.

"PATENT
DESICCATED COFFEE.
(DAVISON & SYMINGTON, PATENTEES.)

"This principle is perfectly novel, being effected entirely by HOT AIR, a the peculiar advantage of improving the article, both in colour, strength, quality, preserving purity, richness of flavour, and all its aromatic qua whilst it excludes all burnt and acrid matter which, under the ordinary pr invariably arises. It is recommended by the most eminent of the facult being especially adapted to persons of weak digestive organs.

J. D. BROWNING."

Adulterated—with chicory.

5th Sample.—Purchased of Sidney, Wells, and Manduell, 8. Ludgat Contained in a bottle. Price 1*s.* 6*d.* per pound.

"VERY CHOICE WEST INDIA COFFEE
at 1*s.* 6*d.* per pound,
From the
TEA ESTABLISHMENT,
8. Ludgate-hill."

ed—with chicory.

—Purchased of Dakin & Company, No. 1. St. Paul's Church-yard.
4*d.* per pound.

g to be supplied with a pound bottle of coffee, the inquiry was made,
wished to have it pure, or mixed with chicory. We answered pure;
, on examination, to be

rated.

.—Purchased of Mr. Pringle, 77. Bishopsgate-street Without.
4*d.* per pound.

"The Finest Concentrated
MOCHA
COFFEE.

ffee cannot fail to give great satisfaction, being a combination of the
ntain growths of Arabia. It is roasted upon an entirely new prin-
has the peculiar advantage of improving the article in strength and
serving purity, richness of flavour, and all its aromatic qualities.
om the cylinder, it is ground and packed in air-tight canisters, to
poration, and will for a lengthened period retain its strength and
flavour."

ed—with a considerable quantity of chicory.

—Purchased of Mr. Skelton, 49. Bishopsgate-street Within. Price
pound.

"SKELTON'S
COSTA RICA
PATENT
ROASTED COFFEE.

ell-known fact, that from the earliest introduction of Coffee as an
everage, the roasting has been effected solely by the berries coming
with hot metal, or other hot surfaces, which, as a natural result,
chars the outside to a considerable extent before the interior is
sing that burnt disagreeable flavour so frequently complained of,
ighly pernicious effects of empyreumatic oil thus generated.
iccating Process ensures the most perfectly uniform roast by a cur-
tmospheric air alone, thereby expelling all impurities, as they evolve
arly stage of the process; at the same time, so complete is the appa-
e moment the aroma begins to develop itself, which occurs only a
previous to the roasting being completed, that instant all escape is
thus the low-priced coffees become *Mochaised*, and rendered soft
the palate, and the finest coffee is improved, inasmuch as the
g roasted uniformly throughout their substance, without charring
surface, make, to all intents and purposes, a new beverage—a
e—such as the weakest stomach will bear and enjoy.

"TESTIMONIALS.

"29. New Broad-street, May 3rd, 1848.

een favoured with two samples of the same kind of Coffee, of which
n roasted by the Patent Desiccating Company's process (Davison
on's patent), the other by the ordinary process, I found, on using
e beverage made from the former was decidedly clearer and brighter
m the latter, and that it had also considerable advantage in point of
g free from a certain bitter and somewhat pungent taste, which
s palatable and potable.

"Apothecaries' Hall, May, 1848.

have submitted the sample of coffee roasted by your improved pro-
h me, to a careful chemical examination, and find it to be free from

the strong, acrid, empyreumatic oil, which gives to Coffee, as ordinarily pr pared, so much of its unpleasant flavour, and doubtless, also, its injurious effe on many constitutions, at the same time that it possesses all the fine aromat properties unimpaired: it is also much more evenly roasted throughout i substance, and I consider it a very great improvement on the old process.

I remain, Sir, yours respectfully,
R. Warrington, Chemical Operator."

Adulterated — with a small quantity of Chicory.

9th Sample. — Purchased of James Robinson, 156, Bishopsgate-street Withou in half-pound canisters. Price 10*d*.

"ROBINSON'S
Patent Compressed Coffee,
9, Lamb-street, Spitalfields, London.

"It is a well-known fact, that although the finest Coffee in the world is i ported into England, yet the British public have it from the dealer in suc state that the decoction therefrom is deficient of fragrance and briskness, i is unsavoury, flat, and unsatisfying. Those who purchase the Compr Coffee will have no reason to complain of this. It is roasted upon new scientific principles, and at the moment it is done to perfection, it is placed the *Mills* while hot. It is immediately compressed into tin canisters by pow machinery, and made perfectly air-tight. By this means, the vegetable oil retained, and the delightful fragrance is preserved, instead of allowing i evaporate. The coffee is always fresh, as if it were roasted and ground only moment before, and is remarkable for richness in drinking and fulness to palate, combined with that delicious flavour which has not been hitherto tained. — Sold in tin canisters of one-pound and half-pound each, at 1*s*. 1*s*. 8*d*., and 2*s*. per pound.

"*Caution.* — None is genuine without the annexed signature, to counterf which is felony: — James Robinson."

Adulterated — with a large quantity of chicory.

10th Sample. — Purchased of James Robinson, 156, Bishopsgate-street Witho one pound, in stoppered bottle. Price 1*s*. 4*d*.

"ROBINSON'S
Patent Compressed Coffee.
One Pound Nett Weight of the
Finest Jamaica Coffee,
One Shilling and Fourpence Per Pound.

"This delicious and aromatic berry, the valuable properties of which, b process adopted in the roasting, are preserved in the highest perfection, so in making, the very essence becomes speedily and entirely extracted, render it the most nutritious, exhilarating, and economic beverage it is possib procure.

To be obtained only at
JAMES ROBINSON'S
Celebrated Tea and Coffee Warehouse,
156, Bishopsgate-street Without.

N.B. — This coffee, roasted on the premises, and packed in bottles with tight stoppers, under the immediate inspection of J. R., will be found to re its full strength and flavour for any length of time, in any climate."

Adulterated — with a considerable quantity of chicory.

11th Sample. — Purchased of Lindsey & Company, No. 1, Waterloo-road.

"One Pound Canister
Of the Finest Concentrated
PLANTATION COFFEE,
Fresh Roasted and Packed,
FROM
THE GREAT SOUTH WESTERN
Tea Establishment."

Adulterated — chief ingredient chicory; not much coffee.

12th Sample. — Purchased of Edmund Folkard, 40. Drury-lane. Half-pound canister. Price 6*d.*

"HALF-POUND CANISTERS
Of the celebrated
EXHIBITION COFFEE,
Consisting of a combination of the Finest Coffees from All Nations.

No. 3. — SIXPENCE.

"This beautiful compound of coffee gives that rich aroma so highly appreciated by Continental travellers, produces a beverage strong, bright, and clear, is rich and mellow in flavour, and must be appreciated by all the LOVERS OF A CUP OF GOOD COFFEE.

"This coffee being roasted on the most improved principle, which confines all that fragrance (which evaporates with the common roaster) so delightful and pleasing to the palate, and being packed hot, both from roasting and grinding, in well-seasoned canisters, which being perfectly air-tight will keep for any reasonable length of time, or in any climate, without the least injury to its original flavour; offering at once a canister of the finest compound of coffees ever imported into Europe.

TO BE HAD ONLY OF
EDMUND FOLKARD,
(From North, Simpson, Graham, and Company,)
GROCER, TEA-DEALER, AND ITALIAN WAREHOUSEMAN,
No. 40. DRURY-LANE,
(Opposite Great Queen-street.)"

Adulterated — scarcely any coffee; nearly all chicory and mangel-wurzel.

13th Sample. — Purchased of Edmund Folkard, 40. Drury-lane, half-pound canister. Price 8*d.*

Adulterated — containing very little coffee, but consisting chiefly of chicory and mangel-wurzel.

14th Sample. — Purchased of Westbrooke & Company, 21. Oxford-street, corner of Hanway-street. Price 1*s.* 4*d.* per pound.

"FINEST
JAMAICA COFFEE
IMPORTED,
(Containing Chicory),
ONE SHILLING AND FOURPENCE THE POUND.

"Roasted on an improved principle for evaporating the equaceous, bitter, and acidulous properties, retaining the rich aroma and exhilarating qualities of the berry."

Adulterated — with a considerable quantity of chicory.

The words "Containing Chicory" were written on the wrapper, and not printed. In making the purchase, no intimation was given that the article contained chicory.

15th Sample. — Purchased of M. Jones & Company, 166. Oxford-street. Price 1*s.* 4*d.* per pound.

"POUND CANISTER
Of Fine Rich
MOUNTAIN COFFEE
At 1*s.* 4*d.* per lb.
No Charge for Canister."

Adulterated — with a considerable quantity of chicory.

16th Sample. — Purchased of James Way & Company, 272. Oxford-street. Price 1*s.* 4*d.* per pound.

"WAY'S PATENT COMPRESSED
COSTA RICA COFFEE.
PURE COFFEE.
ROASTED BY STEAM.
THE OLD ESTABLISHED WAREHOUSE,
272. Oxford-street.

"The consumption of COFFEE at this season of the year greatly increases; and as ninety-nine houses out of one hundred adulterate Coffee, the Proprietors of this Establishment offer *Pure Coffee*, feeling confident that the experiments their Coffee Buyer has made during his recent visit to Paris, enables them to supply Coffees such as are used in the *Café in France*. The Public will find that —

1lb. of Pure Coffee will go as far as 1½lb. that is adulterated.

One Pound of Pure Costa Rica Coffee - - -	1*s.* 4*d.*
One Pound of Pure Jamaica Coffee - - -	1*s.* 6*d.*
One Pound of Pure Mocha Coffee - - -	1*s.* 8*d.*

One Trial of the above Coffee as a sample is earnestly solicited.

JAMES WAY & Co."

Adulterated — with a considerable quantity of chicory.

17*st Sample.* — Purchased of Rogers & Company, 97. Crawford-street. Price 1*s.* 4*d.* per pound.

"PURE
PARISIAN COFFEE,
(Requires no boiling.)

"It is a well-known fact that France for nearly a Century has been noted as the only place where Coffee could be procured with that Aromatic Fragrance so pleasing to the taste of the most refined Connoisseur.

"Many attempts have of late been made in England to bring this delightful beverage to the same perfection; but have proved fruitless.

"Messrs. R. & Co., after many years' experience, have succeeded in preparing a true Parisian Coffee, the Decoction of which will be found equal to that obtained in the celebrated Cafés of Paris.

"We especially direct public attention to the manner in which our Parisian Coffee is Ground, as a proof that much greater importance must be attached to the Grinding than is ordinarily the case, since many persons who grind their own through small Mills, do not crush the Coffee sufficiently to allow the whole of its Aromatic properties to be extracted without boiling, which at once deteriorates the beverage by evaporating its Fragrance. Therefore, to make good Coffee, it is necessary that it should be ground sufficiently fine, and not boiled.

"This exquisite Coffee is roasted under the immediate superintendence of the Proprietors, Ground Hot from the Cylinder, and compressed into Air-tight Canisters, thus preserving that delightful Aroma and Fragrance so generally sought after. It also possesses many advantages, being double the strength of ordinary Coffee, and when made is perfectly bright and clear.

Price 1*s.* 4*d.*, and 1*s.* 8*d.* per Pound.
(No charge for Canister.)"

Adulterated — more than half the article consisting of chicory, mangel-wurzel, and a third vegetable substance.

18*th Sample.* — Purchased of Stanbury, Brothers, & Co., 2. Portman-place, Edgware-road.

"SELECTION OF THE BEST
COFFEES
IMPORTED,
Packed Air-tight.

"This delicious and aromatic berry, the valuable properties of which, by a process adopted in the roasting, are preserved in the highest state of perfection, so that in making the very essence becomes speedily and entirely extracted, rendering it the most nutritious, exhilarating, and economic beverage it is possible to procure.

TO BE OBTAINED ONLY AT

STANBURY, BROTHERS, AND CO.

"It is warranted to keep fresh and good for six months, if the lid be placed on directly after using."

Adulterated — with a considerable quantity of chicory, which forms nearly one-half the article.

19th Sample. — Purchased of T. Horne, 124. Edgware-road. Half-pound canister, price 8*d.*

"HALF A POUND CANISTER OF
T. HORNE'S
Finest Concentrated
COFFEE.
Price 8*d.*, Canister included.

"This coffee is roasted on the best and most approved principle, by which means the rich aroma and exhilarating qualities of the berry are perfectly retained.

"By being packed in perfectly air-tight canisters, it will keep good for any length of time."

Adulterated — consisting principally of chicory; not much coffee.

20th Sample. — Purchased of C. E. Back, 123. Tottenham-court-road. Price 1*s.* per pound.

"ONE POUND CANISTER OF
Fine Concentrated
TURKEY COFFEE.

"This coffee is roasted entirely upon an improved principle, whereby that richness of flavour and fragrance so much sought after by all connoisseurs is preserved. It is ground immediately after it is roasted, and while in a warm state secured in packages impervious to the air; it is thus uninjured by the atmosphere, and for a lengthened period retains its full fragrant richness.

TO BE HAD ONLY AT
C. E. BACK'S
EUROPEAN
COFFEE MART."

Adulterated — chiefly chicory; very little coffee.

21st Sample. — Purchased of Salmon & Company, 69. Tottenham-court-road. Price 1*s.* 4*d.*

"ONE POUND,
Ground and Compressed,
Finest
JAMAICA COFFEE.

"There are now so many methods of roasting coffee to which the public attention is directed, that the vendors of this superior coffee will not lay claim to any of them: suffice it to remark, that they have tried all plans now extant for roasting coffee, and have come to this conclusion — that there is very little difference between any of them, the grand secret, after all, being, to use only good coffee. None of the systems of roasting, whether patent desiccated, by steam, in silver cylinders, or any other of the new-fangled modes which it is the prevailing practice to vaunt before the public, are capable of converting bad coffee into good. The desideratum required, then, is good coffee. On this we make our stand, and resolve to sell none but 'good coffee.'

SALMON AND COMPANY,
DEALERS IN TEA, COFFEE, AND
COLONIAL PRODUCE."

Adulterated — containing a considerable quantity of chicory.

22nd Sample. — Purchased of Bousfield, 111. Tottenham-court-road. 1s. 6*d.* per pound.

"This canister contains
One Pound
of the Finest
MOUNTAIN BERRY MOCHA.
Price 1*s.* 6*d.*,
Canister included.

"This coffee is particularly noted for its great strength and truly delicic
vour, very superior to any other kind imported, and being packed perfect
tight immediately after it is roasted, preserves the aroma and richness s
desirable to all who delight in a cup of really fine coffee. To families re
in the country we especially recommend it.

From
BOUSFIELD'S."

Adulterated — with a considerable quantity of chicory, which forms one-third of the article.

23rd Sample. — Purchased of Stubbs, 140. Edgware-road. Price 1*s*
pound.

"Coffees roasted on the premises daily, and packed hot.

This canister contains
One Pound of
Choice
JAMAICA COFFEE.

"This coffee is particularly noted for its great strength and truly del
flavour, very superior to any other kind imported, and, being packed per
air-tight immediately after it is roasted, preserves the aroma and richn
very desirable to all who delight in a cup of really fine coffee. To famil
the country we especially recommend it.

Observe! Sold only by
STUBBS."

*Adulterated — with a considerable quantity of chicory, which forms more
half the article.*

24th Sample. — Purchased of A. Andrews & Co., 57. Tottenham-court-
Price 1*s.* 4*d.* per lb.

"Dr. Fothergill's Method of Making Coffee.

"Let coffee be made in the usual manner, only a third part stronger;
much boiling milk be added to the coffee before it is taken from the fire, as
is water; let it settle; drink it with cream, or without, as may be most a
able. Very little sugar ought to be used with the coffee; on weak stoma
is too apt to become acid, if made sweet, and this is one reason why
people forbear drinking coffee. I do not presume to settle the important
tion: which is preferable, tea or coffee? This must be left to the expe
of individuals. Though I like tea, I found it not quite favourable to my he
from some circumstances, I tried coffee made in the manner above menti
and have drunk it almost constantly many years, without receiving any i
venience from it, but, on the contrary, very great benefit."

Adulterated — consisting chiefly of chicory, with but little coffee.

25th Sample. — Purchased of Mr. Holme, 132. Tottenham-court-
Price 1*s.* 4*d.* per lb.

"One Pound Nett Weight,
Concentrated
COSTA RICA COFFEE,
Of Great Strength and Flavour.
Sole Proprietor of the Celebrated Compound Coffee.

Adulterated — with a small quantity of chicory.

26*th Sample.* — Purchased of Hawthorn & Co., 38. Tottenham-court-road.

"HAWTHORN'S
EXTRAORDINARY
COFFEES!
It being the Testimony of Each Consumer that they are
UNSURPASSED AND UNEQUALLED.

"These coffees are roasted, and prepared by H. & Co.'s unique and perfect process, invariably developing all the strength, dispelling all objectionable properties, and always retaining the whole of the fragrant richness of this delightful berry, and, without exaggeration, presenting to the consumer coffee of most exquisite flavour and of matchless strength.

"The wonderfully large sale and wide-spread notoriety throughout London and the provinces, which H. & Co.'s coffees command, insure to all coffees of the freshest, strongest, and most fragrant character, and render it necessary to state that they are procurable only at the

Tottenham-court-road
COFFEE MILLS,
38. Tottenham-court-road,
Corner of Percy-street."

"The Prices for these
Unrivalled and Splendid
COFFEES
are
1*s*. 8*d*., 1*s*. 6*d*., 1*s*. 4*d*., 1*s*. 2*d*., and 1*s*.

"Their most beautiful flavour, owing to H. & Co.'s scientific admixture of varieties of coffees, and their great strength, resulting from H. & Co.'s peculiar mode of preparation, demand a continuous and increasing engagement of public favouritism and approval."

A bill, extensively distributed to persons passing by the establishment of Hawthorn & Co., is worded as follows: —

"COFFEES *without* CHICORY
or
COFFEES *with* CHICORY,
At the option of the Purchaser.

"HAWTHORN & COMPANY pledge themselves that all their Coffees are of the Finest Sorts, and that their Chicory is also the most genuine; and they now positively assert that they never have used any other than the Best and Purest of each. Hawthorn & Company's high character for Fine Coffees, and their LARGE SALE, is a sufficient guarantee to the customer, that they have not obtained that sale and that character by the use of inferior or of adulterated articles, and is also a security that their Coffees without Chicory, or their Coffees with Chicory, are all respectively of the

FINEST, PUREST, AND MOST GENUINE DESCRIPTIONS;

and they as positively deny any knowledge or use of the various infamous adulterations which are said to have been employed in the admixture of Coffees by some of the grocers in London and the country; and whilst they wish every one should be enabled to procure Fine Coffee and Pure Chicory separately, if desired, they respectfully announce that if bought from them in the mixed state, that none but the best of each is used; and with regard to the beneficial influence of Chicory with Coffee, they quote an extract on the subject from the *Morning Advertiser* —'We will undertake to say, that owing to the far richer flavour as well as greater cheapness of the mixed article, the Retail Dealers would sell Fifty Pounds for every One Pound they vended of Coffee without [illegible]

THE TOTTENHAM COURT ROAD Co[illegible] MILLS.

From Hawthorn's Price Current.

"London,
38. Tottenham-court-road,
corner of Percy-street.

HAWTHORN & Co.

"Our aim has been, to obtain unequalled excellence in the Roasting of Coffees; and our Sale of Coffees, for years, has been so considerable, and is so greatly increasing, that to meet this gratifying demand, we have recently erected on our premises the most Unique, Elegant, and Complete Machinery in the World, for the threefold purpose of Roasting the Raw Coffee, in the first place, without chance of its contracting that unpleasant flavour known as too high burnt; secondly, of preparing Coffees on the French Principle, which developes that Mellow Richness peculiar to, and justly characteristic of, this favourite article of consumption with our Gallic neighbours; thirdly, of pulverising it when roasted, so that the action of boiling water on Coffees thus prepared will instantly extract all the delicious fragrance and strength of this exhilarating berry.

Hawthorn and Company's Coffees
are roasted daily,

And we feel justified in using the commendatory expression so often pronounced on our establishment by our numerous French Customers — 'C'est la meilleure boutique pour le Café et pour le Thé en Londres.'"

A fourth placard contains the following: —

"HAWTHORN'S inimitable rich Coffee, 1*s*.

Hawthorn's truly large sale for Coffees compels them to be continually roasting and grinding them, so that purchasers can always have their

Coffees Hot from the Roaster and Fresh from the Mill,
At your most obedient and attentive servants'

HAWTHORN & Co.,
38. Tottenham-Court-Road."

Adulterated — the greater part of the article consisting of chicory, with little coffee to be detected.

27*th Sample.* — Purchased of Nicol & Company, 15. Rathbone-place, Oxford-street.

"APOLOBAMBA COFFEE,
(Ground,)
One Shilling and Eightpence per Pound,
Including the Canister.

"This peculiarly fine, rich, old, mellow-flavoured coffee, being packed in air-tight tins immediately it is roasted and ground, will retain its freshness and exquisite fragrance any length of time.

From
NICOL & CO.'S
Colonial Coffee and Tea Mart."

Adulterated — with chicory, and containing a few particles resembling acorn.

28*th Sample.* — Purchased of Christie & Company, 12. Norton Folgate, Bishopsgate.

"The Patent Coffee Roaster,
Protected by Her Majesty's Royal Letters Patent.
One Pound
Of Exquisitely Fine
JAMAICA COFFEE,
At 1*s*. 6*d*.,
Including Canister.
Sold Wholesale and Retail by
CHRISTIE AND COMPANY.

"The Royal Society for the Promotion of the Arts have pronounced it one of the most useful inventions of the age; Prince Albert, their President, in June last, delivered to the patentees their premium gold medal, with a complimentary address on the merits of the invention.

"The Patent Roaster dissipates the acidity and burning qualities of the coffee, which the ordinary mode of roasting does not remove, and renders it soft, nutritious, and delightful.

"It is packed hot and warm from the roaster and mills, in air-tight canisters, whereby it can be kept for a length of time in the highest state of perfection.

"The unprecedented demand for this coffee is the best evidence of its unquestionable superiority over all other coffee."

Adulterated — with a considerable quantity of chicory.

29th Sample. — Purchased of J. Chatfield, 10. Aldgate High-street, City.

"HALF-POUND CANISTER OF
CAFE DE LA FLAVOUR FRANCAISE;
OR, THE
TRUE PARISIAN
COFFEE,
Possessing great strength and superiority of flavour,
FOR SIXPENCE.

"This beautiful compound of coffee gives that rich aroma so highly appreciated by Continental travellers, produces a beverage strong, bright, and clear, is rich and mellow in flavour, and must be appreciated by all the LOVERS OF A CUP OF GOOD COFFEE.

"This coffee being roasted on the most improved principle, which confines all that fragrance (which evaporates with the common roaster) so delightful and pleasing to the palate; and being packed hot, both from roasting and grinding, in well-seasoned canisters, which being perfectly air-tight will keep for any reasonable length of time, or in any climate, without the least injury to its original flavour; offering at once a canister of the finest compound of coffees ever imported into Europe.

This quality to be obtained only at
J CHATFIELD'S
TEA AND COFFEE ESTABLISHMENT,
No. 10.
Aldgate, High-street,
City."

Adulterated — with a considerable quantity of chicory; taste and odour very disagreeable.

From an examination of the above Table of Analyses, it appears —

1st. *That the whole of the Twenty-nine Packages, Bottles, and Canisters of Coffee, submitted to analysis, with a single exception, were adulterated.*

2nd. *That in Twenty-eight of the samples, the adulteration consisted of chicory; this root, in many instances, constituting the chief part of the article.*

3rd. *That Three of the Samples contained mangel-wurzel.*

4th. *That roasted wheat-flour was present in Two of the Coffees.*

Contrasting these results with those obtained from the analyses of loose coffee, given in our last Report, it is manifest that CANISTER COFFEE is, of the two, by far the more extensively adulterated. This conclusion was anticipated, from the circumstance that coffee in canisters is commonly sold at the same price as loose coffee, notwithstanding the extra cost of the case

We therefore now repeat the recommendation given in a previous Report, not to purchase coffee in canisters, since the public obtains, in general, an inferior article, and has to pay from two to three pence on each pound, as the price of the canister.

The contradictions, exaggerations, and untruths contained in the advertisements which we have quoted, are not less numerous, unprincipled, and, i-cases, even fraudulent, than were those set forth in the hand-bills inserted in the previous Report.

It will be perceived that mixtures of chicory and coffee, the former constituting in some cases the more considerable portion of the article, are unhesitatingly denominated, "FINEST MOCHA COFFEE;" "FINEST CONCENTRATED PLANTATION COFFEE;" "CHOICE JAMAICA COFFEE," "FINE CONCENTRATED TURKEY COFFEE," &c.

It will likewise be observed, that the occurrence of the word "GENUINE" on the labels, affords little or no guarantee that the coffee thus attested is really what the vendors profess.

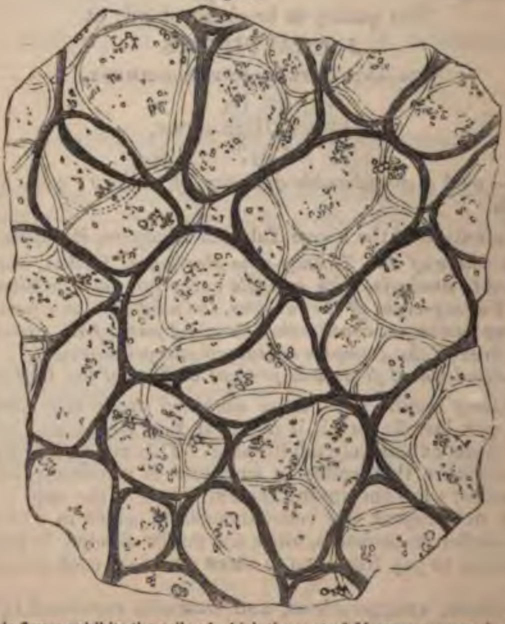
Neither do the words "PATENT CONCENTRATED" indicate what they are meant to imply, since the great proportion of those who make use of them really possess no "patent" at all, the assumption being wholly unwarrantable. The degree of "concentration" may be inferred from the quantity of chicory frequently present.

The phrases, "*Packed in Air-tight Canisters*," "*Hot and Warm from the Mills*," whereby the fragrance, aroma, &c., are retained, read exceedingly well on paper, but we fear do not tend to improve very much the quality of the coffee, since the canisters are not constructed so as to be really air-tight. The bottles furnished with glass stoppers fitted to perforated corks, are nearly air-tight, and doubtless more calculated for the preservation of the article.

To show what little faith the public ought to place in the statements and notifications exhibited in the shop-windows and on the wrappers of grocers' goods, we may mention, that some printers keep these forms of announcements, accompanied by illustrative woodcuts, permanently set up in type, and supply the numerous grocers with the same, at little more than the cost of the paper; the difference in each case merely consisting in the insertion of the name and address of the grocer to whom the bills and placards are supplied.

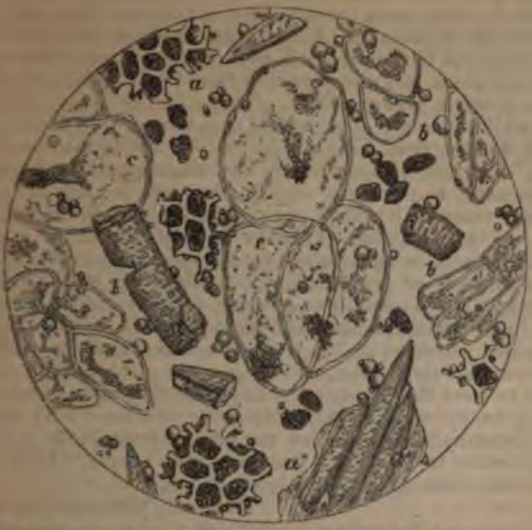
In our previous Report, we gave engravings exhibiting the structures detected in samples of coffee adulterated with *chicory*, *roasted wheat-flour*, and *beans*; we now insert some additional drawings representing the appearance of samples of coffee adulterated with *mangel-wurzel* and *acorns*.

Fig. 64.



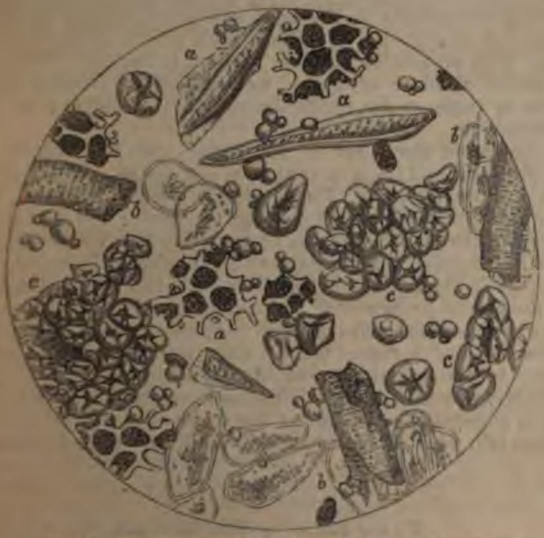
This figure exhibits the cells of which the root of MANGEL-WURZEL is chiefly formed: it will be observed that they are several times larger than those of chicory root.

Fig. 65.



Shows the structures met with in *Coffee adulterated with* MANGEL-WURZEL. *a a*, fragments of the coffee-berry; *b b*, cells of chicory; *d d*, ditto of mangel-wurzel.

Fig. 66.



Sample of *Coffee adulterated with ground* ACORN. *a a*, coffee; *b b*, chicory; *c c*, acorn.

HE ANALYTICAL SANITARY COMMISSION AND MR ABBISS.

To the Editor of THE LANCET.

—The gentlemen composing the "Analytical Sanitary Commission" mmitted, through mistake as to sample or otherwise, a very grave error, g seriously my character as a man and a tradesman.

he strictures on my circular and coffee in this day's LANCET, they have not only published what I had previously done—viz., that I mixed *chic* with my coffee, but they state that the sample obtained from my shop contain "*some roasted wheat farina.*" While I am ready to concede to any man body of men the right to publish their own opinion, I must demur to any unf advantage being taken, and any deviation from truth being made in furtheran of any object, however praiseworthy.

Now, Sir, while *I readily admit that I use chicory*, I distinctly, emphaticall and solemnly declare, that *I never have, in one single instance*, used "*roast wheat farina*," and that I do not in any way whatever, either myself, or by tho in my employment, use or have on my premises, for the purpose of mixi with coffee, any other article than *pure chicory*, although discredit is attempt to be thrown on the assertion. I always buy the root in the raw state, to pr clude the possibility of being deceived by a manufactured article.

As I hope no body of gentlemen would allow any man to suffer injury injustice through their oversight or mistake, I do earnestly demand the Sanita Commission to do me the justice *publicly to proclaim my innocence* with resp to "some roasted wheat farina" having been found in my coffee, *as publicly they have proclaimed their error.*

I am ready to meet the Commission any time they may appoint; I am rea to prove by all in my employment, or by those who have left; and I am willi to allow the Commission to examine my men, my stock, or my books, and render every facility to prove that there is a grave error, which error I trust the honour of the Commission publicly to retract.

I am, Sir, your obedient servant,
J. A. Abbis

60, Gracechurch-street, City, May 3. 1851.

P. S.—An early reply will be esteemed.

*** Fully impressed with the great responsibility of the task we have und taken, it is our practice to observe every precaution, and we make it a r before publishing statements in the least calculated to have an injurious e upon the interests of any one, to submit each article to at least two disti examinations. This precaution was not omitted in the case of Mr. Abbiss, in order to ensure absolute certainty, we were at the trouble of procuring second canister of coffee at the establishment of Mr. Abbiss, and of submitti it also to examination.

Since the receipt of the letter of Mr. Abbiss, we have again analysed samples of coffee, and find them to contain wheat farina, the quantity in one the samples being considerable. Had a mistake been committed, we should have hesitated for a moment to acknowledge the error; and as, in the course the examination of the many hundreds of articles which will necessarily hav pass through our hands, errors may, and probably will, arise, we take opportunity of distinctly stating, that in every such case we shall acknowledge mistake with the utmost promptitude and candour. We now place at the disp of Mr. Abbiss a sample of the coffee to which our published analysis referred. Wh Mr. Abbiss has obtained a report upon it from microscopists of distinction, shall be happy to publish the result in the columns of The Lancet. entirely acquit Mr. Abbiss of any participation in or knowledge of the adulterat or admixture in question, and we advise him to institute a rigorous investiga in order to ascertain whether he may not himself have been deceived or imp upon.

To the Editor of The Lancet.

Sir,—Allow me to state that I have been an assistant at Messrs. Abbiss & for these last five years, and can positively assert that during that time there been nothing whatever mixed in his coffee but pure chicory; and from knowledge of the article, having been in the trade for thirty years, am bound believe your assertion to be quite incorrect.

I am, Sir, your most obedient servant,
Benjamin Jam

60, Gracechurch-street, May 12, 1851.

To the Editor of The Lancet.

—Having for the last seven years had the most ample means of knowing
nner in which Mr. Abbiss's business is conducted, and being satisfied that
lteration of coffee with wheat farina could not be accomplished without
owledge, I wish to state, in the strongest and most solemn manner, that
h adulteration has ever been made here, and that I have no alternative
believe "The Analytical Sanitary Commission" to be in error.

I am, Sir, your obedient servant,
John Thomas Waeelwright.

hurch street, May 12. 1851.

To the Editor of The Lancet.

—I have been in the employment of Mr. James Abbiss for nearly two
during which time I have often seen the coffee mixed, and sometimes
it myself, but with nothing but pure chicory; and to my certain know-
there never has been anything but pure chicory for the above purpose on
emises. And, Sir, I must tell you, that, from my experience of my
, I believe him to be quite incapable of such a petty fraud as that of which
ve so wrongfully accused him.

I remain, Sir, your obedient servant,
Tertius Clark.

acechurch-street, May 12. 1851.

To the Editor of The Lancet.

—I beg most respectfully to inform you, that I have been in the employ-
of Messrs. Abbiss & Co., No. 60. Gracechurch-street, City, for the last
ears, during which time I have had the sole management of the coffees,
most solemnly declare, that nothing but pure chicory is mixed with the
As to wheat farina, I never saw anything of the kind ever since I have
the trade, which is now twenty-three years.

I remain, Sir, yours respectfully,
Wm. James Lewington.

echurch-street, City, May 12. 1851.

To the Editor of The Lancet.

Patent Desiccating Coffee Company,
10. Osborn-street, Whitechapel.

—Having for a considerable time roasted all Mr. Abbiss's chicory, as well
oiety of his coffee, I am ready to make an affidavit that no adulteration
en effected at my establishment, either by myself or by any person in my
, and that all goods entrusted to my care, either for roasting or grinding,
urned to their owners in the same pure state as received.

I am, Sir, yours respectfully,
John Relfe.

n, May 13. 1851.

To the Editor of The Lancet.

Patent Desiccating Coffee Company,
10. Osborn-street, Whitechapel.

—We, the undersigned, being in the employ of the above company,
heard of the charges affecting Mr. Abbiss's moral and commercial
ter by your paper, beg leave to state, that all coffee and chicory roasted
for him are received upon our establishment perfectly pure, and returned
, roasted, in the same condition.

We are, Sir, yours respectfully,
F. Richards, Manager.
T. Durbridge, }
E. Bradford, } Roasters.
J. Dean, }

—If required, we shall be happy to make an affidavit to that effect.

n, May 13. 1851.

The evidence of this correspondence is very strong, and would appear to
clusive with some persons, that the sample of coffee which our commis-

sioner purchased at the establishment of Mr. Abbiss did not conta
wheat farina." As we attach great importance to the *bonâ fide* cha
analytical investigations now in progress, we have not hesitated t
commissioner who made the examination and wrote the report in
sonal communication with Mr. Abbiss, in order that a thorough inq
instituted by persons of acknowledged skill and ability, who ha
expressed any opinion on the subject. Whatever may be the re
inquiry, it shall be made known to the public. We will only state t
always be infinitely more prompt in affording redress, if at any time
should unfortunately contain an error, than in the infliction of an i
however, cannot dismiss this correspondence at this time without re
statement contained in the letter of Mr. Abbiss, published at page
last number of THE LANCET, and those made by the proprietors an
of the "Patent Desiccating Coffee Company," whose communicatio
just inserted. Mr. Abbiss, in his letter, thus writes: — "I always b
(chicory) in the raw state, to preclude the possibility of being de
manufactured article."

From this declaration and others contained in the same commu
inferred that the entire preparation of the chicory and its admixture
took place in the establishment of Mr. Abbiss, but now it turns o
Relfe, of the "Patent Desiccating Coffee Company, 10. Osborn-str
chapel, has for a considerable time roasted *all* Mr. Abbiss's chicory,
moiety of his coffee." This is curious, and it is equally singular
that in not one of the seven communications on the subject is it state
said chicory is ground. At all events, it is now proved as an und
that although Mr. Abbiss purchased his chicory in the raw state, it is
by him, or at his own establishment. How is it that the "Patent Desicc
Company" are wholesale roasters of *chicory?* Why not adopt the
priate title of Patent Desiccating Coffee and *Chicory* Company.
repeat, that we entirely rely on the statement made by Mr. Abbiss,
never intentionally or knowingly sent from his establishment coffee
any other admixture than chicory. Should it be found, as the re
inquiry now in progress, that the coffee examined by the Commissio
contain roasted wheat farina, or any substance closely resembling it,
the public will gain so much by our labours, in this case, as Mr. Abb
and as the matter stands, with the evidence which we now publis
faith of Mr. Abbiss in conducting his establishment is entitled to
admission.—ED. L.

To the Editor of THE LANCET.

SIR,—In your remarks upon my letter at page 530. in THE L
conclude thus:—

"We entirely acquit Mr. Abbiss of any participation or knowle
adulteration in question, and we advise him to institute a rigorous in
in order to ascertain whether he may not himself have been deceived
upon."

The communications which you have received and published are t
that investigation; and I now beg to call your special attention to th
fact, that the coffee and chicory have been traced from the *raw stat*
the processes of *roasting*, *nibbing*, *grinding*, and *packing;* that *e*
through whose hands they have passed, both on my own premises
on those of the "Patent Desiccating Coffee Company," is ready to
that no admixture of "wheat farina" was ever effected, *in any s*
preparation.

Thus you have the evidence of ten persons, being ALL who were
in the preparation of the coffee and chicory *from first to last;* and w
testimony goes to prove AS FAR AS HUMAN TESTIMONY CAN PROV
Analytical Commission must have erred in the matter.

With this mass of conclusive evidence before you, I must call you
to another quotation from THE LANCET of Saturday last, p. 557.:—

We will only state, that we shall always be infinitely more prompt in rding redress, if at any time our reports should unfortunately contain an r, than in the infliction of an injury."

have now to add, that having acted upon your suggestion, (quoted above,) the results having been perfectly satisfactory and conclusive to my mind, I not for a moment doubt but that they will be so to yours.

ith respect to your proposal, that I should submit the sample handed to me he examination of some eminent microscopist, it appears to me, under the mstances, that no satisfactory results would be obtained by that course, as, g driven by the foregoing evidence to the conclusion that there must have some error with respect to the sample (notwithstanding the certificate of commissioner to the contrary), the sample handed to me would naturally ticipate in such error; and being thus doubtful as to the authenticity of the ple, any results from it must necessarily be unsatisfactory. In saying this, not for a moment intend to impute deception to any one; but I submit, it ne of those errors, such as you admit may, and probably will, occur in the rse of your investigations.

aving thus fully, fearlessly, and impartially reviewed the matter, I leave attested facts before you; and it now remains for you promptly and frankly cknowledge the error into which, by some unfortunate circumstance, your missioner must have fallen.

I am, Sir, your obedient servant,
JAMES ABBISS.

church-street, City, May 21, 1851.

To the Editor of THE LANCET.

Patent Desiccating Coffee Company, George-yard,
and 10, Osborn-street, Whitechapel.

r,—Supposing your columns to be conducted on fair and honourable ciples, I claim (as a right) your permission to be heard in my own defence. atever may be the result of the "analytical investigation" now in progress, on which you appear to attach so *much* importance, I am satisfied that the e full and complete investigation you choose to make into my establishment, more you, or your "commissioner," as you term him, will be satisfied that all transactions with the trade are arranged upon honourable and equitable terms. think your objection to my designation as a "coffee-roaster" is untenable— is the *bulk* of my trade; and in so designating it, I am not aware that I excluded from the privilege of roasting chicory, if sent to me, as it is by y of the *largest* and *most respectable* traders in coffee, &c.

n acquitting Mr. Abbiss of any participation in the adulterating process, you rectly accuse me with mixing other materials in chicory; such an insinu- n I hold to be both unjust and unreasonable, until you are prepared to prove r assertion.

hen I took the establishment, which has now, I am happy to say, a large extensive patronage among the most respectable of the wholesale and retail lers, both in London and the country, there was a notice on the gates, that ne should be admitted, except on business; that notice I immediately with- w; and I now invite you, and all other inquisitors to inspect my establish- nt at all times. Your charge is not against the mixture of chicory with coffee, the insinuation is, that I mix deleterious or inferior articles with them. reply is to you, come and see; witness for yourself; but do not by mean paltry insinuation attempt the destruction of character of one who is ving with uprightness and integrity to maintain a respectable and honourable ition.

he legitimate office of THE LANCET is to probe, that it may cure the ills of body politic—not to stab, that it may wound private reputation.

I am, Sir, your obedient servant,
J. RELFE.

y 17, 1851.

N.B.—In consequence of the large increase of business, the roasting and nding department is removed from No. 10, Osborn-street, to Goldie's, late a llery in George-yard, Whitechapel. I merely mention this, that you may under no mistake, should you think it desirable to favour me with a visit.

⁂ We cannot state that we are at all satisfied with the contents of these letters. Mr. Relfe speaks of "mean and paltry insinuations." We have made no insinuation: our statement is distinct and unequivocal. Our Commissioner alleges, in terms as plain and simple as can be used, that in two samples of canister coffee purchased at the shop of Mr. Abbiss, both contained chicory and roasted wheat farina. Mr. Abbiss positively denies the adulteration, and adds that his chicory is bought by him in the raw state, and has been roasted at the establishment of Mr. Relfe. Mr. Abbiss does not deny that chicory was mixed with the samples of coffee which our Commissioner purchased, but he has produced strong evidence to prove that there was no admixture of wheat farina in the samples of coffee obtained at his establishment. Now, our Commissioner makes no insinuation—he asserts positively that the samples do contain roasted wheat farina. Since our last publication that gentleman and Mr. Abbiss have had an interview, and before they separated it was agreed that the samples were to be examined by persons of competent ability, one to be chosen by the Commissioner, one by Mr. Abbiss, the two thus named to choose a third, and the result of their investigation to be published in THE LANCET. Mr. Abbiss now thinks "that no satisfactory results would be obtained by that course:" we think otherwise. If Messrs. Abbiss and Relfe decline such a scrutiny the fault will not rest with us, but with themselves. After the bold statements made in the first letter of Mr. Abbiss (THE LANCET, page 530.) we cannot discover how he can properly withdraw from such an investigation. *It is a question of fact.* Does the coffee purchased, as before stated, contain roasted wheat farina? If not, our Commissioner is wrong; if it does, how did it get there? These are questions which ought to be solved conclusively, and a doubt on the subject should not remain on the mind of any person. *We* now challenge a further scrutiny.—ED. L.

To the Editor of THE LANCET.

SIR,—In THE LANCET of Saturday last, page 584., you state that in the interview I had with your commissioner, it was "*agreed* that the samples of coffee were to be examined by persons of competent authority, &c. &c." I distinctly say that it was not agreed. The commissioner proposed such a course, but I did not "agree" to it. Your own judgment ought to inform you, and it must be evident to every impartial mind that I must be satisfied as to the genuineness of the sample handed to me, before I would rest my reputation on such a test.

In THE LANCET of May the 10th, you admit that "errors may, and probably will arise, in the course of the examination of the many hundreds of articles that will necessarily have to pass through your hands;" as you admit the possibility of error, what guarantee have I that no mistake has been made with respect to my sample? If error be possible, it is just as likely to happen in my case as in any other; if not why not?

What proof have I that the sample the commissioner proposed to submit to arbitration is part of the canister of coffee that came out of my shop? I have only the testimony of your commissioner, and unless you can prove to my satisfaction that he is infallible, why should I believe his single testimony, when you, by implication, disbelieve all the evidence that I have adduced?

Had your commissioner, when he purchased the coffee, and before he took it out of the shop, given me a portion thereof sealed up, I would willingly have submitted it to analytical or microscopical arbitration, and even now, or at any time, I am willing to abide by, and hereby publicly challenge such a test, provided always that I have indubitable evidence that the sample is absolutely a portion of the coffee purchased at my establishment, and that it is in the same condition as when it left my premises.

My reason for insisting upon this point is, that, in my opinion, the samples of coffee with which I am furnished (one from the LANCET Office and the other from your commissioner) never came out of my shop, and, moreover, that the two samples purporting to be out of the same canister, are not the same coffee, being different in colour, granulation, and general appearance; and in this opinion I am supported by every person to whom they have been submitted.

I am, Sir, your obedient servant,
J. W. ABBISS.

60, Gracechurch-street, 26th May, 1851.

ne above letter having been handed to me by the Editor of THE LANCET, state that at the interview with Mr. Abbiss, some days since, it "was that the course suggested by me—viz., that competent and impartial n should examine the coffee purchased by me of Mr. Abbiss, and their be published in THE LANCET. Further, *not the slightest objection* was he proposal by Mr. Abbiss; on the contrary, he admitted that it was fair and honourable. On taking his leave, Mr. Abbiss observed, that " see Mr. Relfe, of the Desiccating Coffee Company," and further cate with me on the subject without further loss of time. Since that have not heard from Mr. Abbiss. I have only a very few more add.

distinctly repeat the assertion made by me to Mr. Abbiss, that no has been committed with respect to the samples of coffee purchased by establishment; and with regard to the "opinion" that the samples by me to Mr. Abbiss had never gone out of his shop, I am prepared, ment, to prove the contrary by *affidavit*. Finally, I think it must be that I have no reason to be dissatisfied with the way in which this little s terminated.

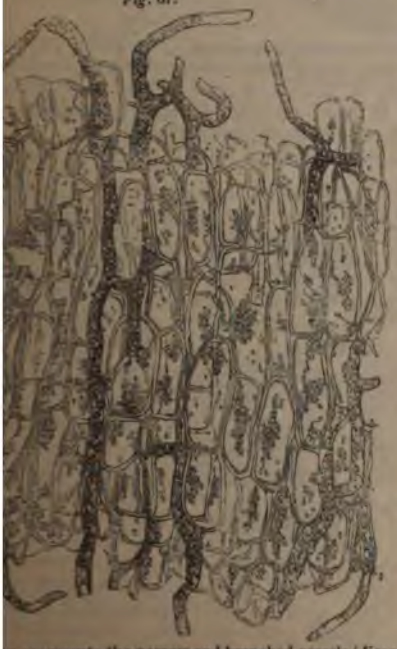
THE COMMISSIONER WHO MADE THE ANALYSIS.

CHICORY, AND ITS ADULTERATIONS.

[SECOND REPORT.]

publication of the first Report on Chicory, we have renewed our and have become acquainted with additional facts relating to the adulteration of that article. These we now embody in a second Report.

Fig. 67.



g represents the narrow and branched vessels (*Vasa* , so abundant in CHICORY-ROOT, which convey the of that plant, and also show their relation to the ricles or cells, of which the substance of the root is made up.

The structure of chicory-root, as well as of many of the productions used in its adulteration, have already been described, to a great extent; in particular, reference has been made to the *Vasa lactescentia*, or milk-carrying vessels of the root of chicory; and it has been stated that they afford a very satisfactory means of discriminating this root from many other vegetable substances. We now insert an engraving, exhibiting the vessels in question.

ADULTERATION OF CHICORY.

The adulteration of chicory with the following substances has already been described:—

CARROT, PARSNIP, MANGEL-WURZEL, BEANS, LUPIN-SEEDS, WHEAT, RYE, DOG-BISCUIT, BURNT SUGAR, RED EARTH, HORSE-CHESNUT, ACORNS.

We have now to notice additional adulterations.

OAK-BARK TAN.

Two samples of a powder have reached us, closely resembling grou
but possessing the styptic and peculiar taste of tan.

On submitting this powder to microscopic examination, we dete
three distinct structures:—

First, curiously constructed radiate cells, resembling those which l
already describ
nexion with t
cane and pepp

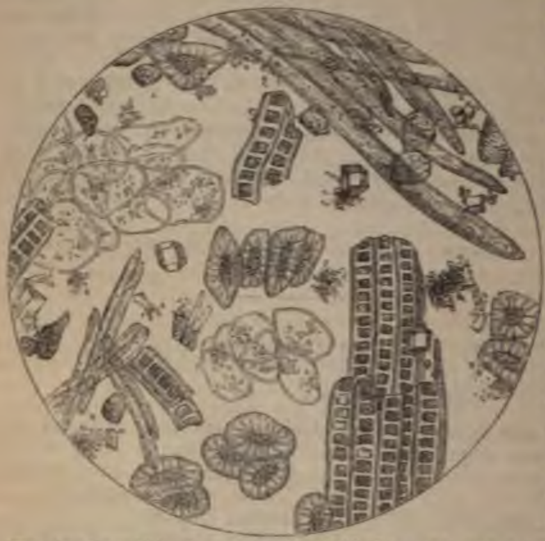
Second, mu
fibre.

Third, cells
of a rounded f

On compari
structures with
with in oak-
found them to
the latter in e
ticular: the ra
formed the
the woody fibr
bulk of the bar
cellular tissue
ated on the inn
and served to
bark to the t
These several s
as seen in the
question, are
the accompany
cut.

This powde
fore, is eviden
up oak-bark
charred, and ground very fine. It may be procured in any quantity, an
to be employed in the adulteration of chicory and coffee.

Fig. 68.



This drawing exhibits the structures detected in OAK-BARK POWDER,—the *radiate cells*, *woody fibre*, and *stricles of cellular tissue*. Drawn with the Camera Lucida, and magnified 140 diameters.

TAN KNOW
"CROAT

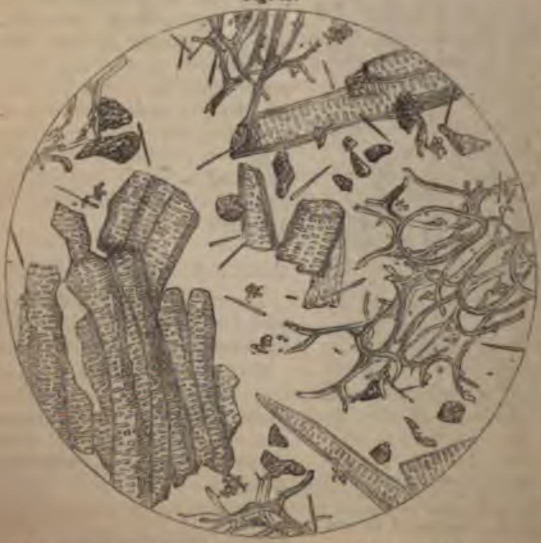
We have rec
veral samples
cle, in the form
bearing a re
in colour to c
having the s
taste of tan.

In it we have
with the mi
fragments of ce
sue, and bundle
fibres, resembli
ducts. These s
are represente
accompanying

The substanc
tion consists
of the bark of
used for tannin

It has been
us that it is em
the adulteratio
and chicory, a
may be purcha
quantity.

Fig. 69.



This drawing exhibits the structures detected in the TAN known in Norfolk by the name of "*Croats*," and used for fuel, &c.

MAHOGANY SAWDUST.

merous statements have been made of the discovery in coffee of mahogany ust. This adulteration is so atrocious, that until recently we have ed to give credence to these statements, and until we ourselves had ob- d evidence that this substance is actually employed in the adulteration of ory.

e fragments of mahogany sawdust may be distinguished by their reddish ur, and by the peculiar structure of the woody fibres. We shall hereafter an engraving representing a sample of chicory adulterated with it.

'e have also evidence to show that other kinds of woody fibre besides ogany sawdust are sometimes employed in the adulteration of chicory.

BAKED HORSES' AND BULLOCKS' LIVER.

a little work recently published by Mr. P. L. Simmonds, entitled "Coffee is, and as it ought to be," the following observations occur in reference to above adulterations.

In various parts of the metropolis, but more especially in the East, are to found liver-bakers. These men take the livers of oxen and horses, bake n, and grind them into a powder, which they sell to the low-priced coffee- p keepers, at from fourpence to sixpence per pound, horse's liver coffee ring the highest price. It may be known by allowing the coffee to stand l cold, when a thick pellicle or skin will be found on the top. It goes her than coffee, and is generally mixed with chicory, and other vegetable ations of coffee."

Ve have received several samples of an article stated to consist of burnt r. It formed a coarse granular powder of a black colour, and possessed a greeable animal smell.

issolved in water, and set aside for a few days, it became extremely nsive and corrupt, showing that it consisted of some imperfectly charred nal matter. As iron was readily detected in the solution, it is probable that his case the substance consisted of burnt blood.

he best way, then, to detect this adulteration, is to set aside an infusion of ory or coffee, when, if this substance be present, in a few days the liquid emit an offensive smell.

HAMBURGH POWDER.

r. Pereira, in 1845, published in the *Pharmaceutical Journal* two very ful articles on the adulteration of coffee and chicory: from the first of these hat on coffee — we extract the following remarks: —

'But while the grocers, on the one hand, cheat their customers by adul- ting coffee with chicory, the chicory dealers in turn cheat the grocers by lterating chicory. The substances employed in effecting the latter fraud are cipally *Hambro' powder* and *coffee flights*.

'*Hambro' powder* consists of roasted and ground peas, &c., coloured with etian red. The term *coffee flights* is applied to the thin membraneous coat docarp) which separates from the coffee seed in the act of roasting."

VENETIAN RED.

n the article on chicory we meet with the following remarks in reference to netian red.

'In a previous number we explained the nature of *Venetian red*. It is ntially the sesqui-oxide of iron, obtained by calcining common copperas lphate of iron). The different colours of the product depend on the temperature to which the sesqui-oxide is subjected. When it has been exposed to intense white heat, its colour deepens, and it is then termed *purple-brown*. e lighter tint of Venetian red is produced by adulteration. Our informant manufacturer) told us that Venetian red was 'adulterated to suit the various tes of the market.' We did not think it expedient to pry into the nature of adulterating ingredient, but a friend suggests that it is *reddle*, the substance d for marking sheep.

"Venetian red is, we believe, the principal substance at present used for colouring chicory; occasionally other agents have been employed. A dealer tells us that he once bought a quantity of chicory, which contained twenty per cent. of logwood and mahogany dust."

It will be seen hereafter that mahogany dust has been detected in one of the samples of chicory powder analysed in this Report; and we strongly suspect it to be present in more than one of the other samples, the examination of which has not yet been brought to a conclusion.

Results of the Microscopical Examination of Twenty-four different Samples of Chicory, purchased at the Establishments of Tea Dealers and Grocers residing in the Metropolis.

1st Sample. — Purchased of A. Teetgen, 154½ Whitechapel-road.
Adulterated — containing ground acorn.

2nd Sample. — Purchased of John Rose, 143. Whitechapel-road.
No adulteration detected; powder very gritty, the greater part charred, and reduced to the state of charcoal.

3rd Sample. — Purchased of William Harvey & Co., No. 4. Mile-end-road.
No adulteration detected; powder very gritty, and, owing to its being too highly roasted, much of it appearing quite black under the microscope.

4th Sample. — Purchased of William Chorley, 18. Whitechapel-road.
Adulterated — containing ground acorn.

5th Sample. — Purchased of William Ricketts, 16. Mile-end-road.
No adulteration detected; powder gritty.

6th Sample. — Purchased of J. P. Miller, 35. Whitechapel-road.
No adulteration detected; powder gritty, and much of it reduced to charcoal.

7th Sample. — Purchased of H. Roakes, 1. Constable-row, Mile-end-road.
Adulterated — containing ground acorn.

8th Sample. — Purchased of M. A. Snowden, 4. Portland-place, Commercial-road.
No adulteration detected; powder very gritty.

9th Sample. — Purchased of Wells & Co., 6. Sydney-place, Commercial-road.
No adulteration detected; powder very gritty, and much of it carbonised.

10th Sample. — Purchased of W. J. Crisp, No. 1. Sydney-place, Commercial-road.
No adulteration detected; powder gritty.

11th Sample. — Purchased of W. Munday, 1. Hereford-place, Commercial-road.
Adulterated — with much sawdust, and contains Venetian red, both visible to the unaided sight.

12th Sample. — Purchased of Samuel James, 93. Whitechapel-road.
No adulteration detected; powder gritty.

13th Sample. — Purchased of D. Francis, 13. King's-place, Commercial-road.
No adulteration detected; powder gritty.

14th Sample. — Purchased of G. W. Back, 137. Whitechapel-road.
Adulterated — with a very considerable quantity of roasted wheat farina.

15th Sample. — Purchased of John Hawkins & Company, 17. High-street, Whitechapel.
Adulterated — with much mahogany sawdust.

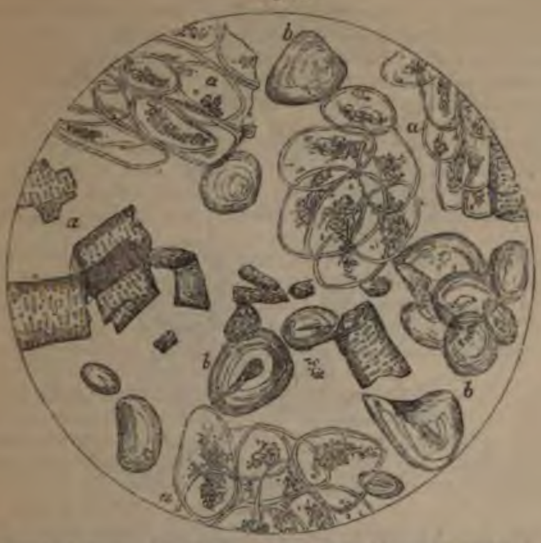
16th Sample. — Purchased of S. Felgate, 23. Commercial-road.
No adulteration detected; powder gritty.

17th Sample. — Purchased of Johnston & Company, 98. High-street, Whitechapel.
No adulteration detected; powder very gritty.

18th Sample. — Purchased of Rogers & Company, 97. Crawford-street, Edgware-road.
Adulterated — with a very considerable quantity of roasted wheat farina.

The nature of the evidence afforded in this case by the microscope will be understood by an examination of the accompanying woodcut.

Fig. 70.



Sample of chicory, *adulterated with roasted wheat farina*. This figure has been made from a minute portion of the ground chicory above referred to. The structures marked *a a* are the cells and vessels of chicory-root, while those marked *b b* are the starch-corpuscles of wheat. No bodies in the least resembling these occur in genuine chicory-powder. The quantity in which they are present, and the partial charring which many of them have evidently undergone, clearly show that they could not have found their way into the powder through accident.

Sample.— Purchased of H. B. Edwards, 87. Edgware-road.
ulterated — with a considerable quantity of roasted carrot.
Sample. — Purchased of Clayton & Company, 4. Broadway, Westminster.
adulteration detected; powder very gritty.
Sample. — Purchased of E. Folkard, 40. Drury-lane.
ulterated — with a very considerable quantity of a root resembling mangel-wurzel.

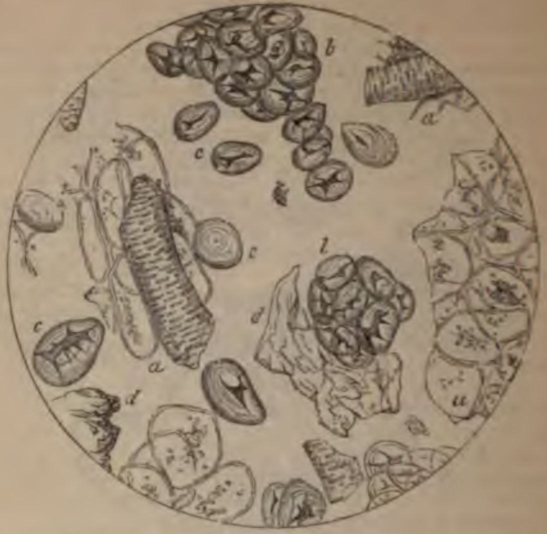
our Report of last week we gave the analysis of two canisters of "Exhi- Coffee," purchased of Mr. E. Folkard, and stated that both were adulter- with a vegetable substance resembling mangel-wurzel. We find the same uction to be present in the chicory powder obtained at the establishment of Folkard.

Sample. — Purchased of James Appleton, 174. Drury-lane.
ulterated — with a very considerable quantity of roasted wheat farina.
Sample. — Purchased of J. M. Guest, 218. Oxford-street.
ulterated — containing a considerable quantity of ground acorn.

e have on several occasions detected the same production in samples of procured of Mr. Guest. It is one which is evidently frequently contained wdered chicory; and we have noticed it in smaller quantity in no less than out of the twenty-three samples, the analyses of which are given in this rt. From the amount generally present, it is evidently used to impart property to the chicory — probably to render it more bitter — rather than e sake of its bulk.

e following engraving represents a sample of chicory-powder adulterated the production in question.

Fig. 71.



This woodcut exhibits the structures detected in the chicory purchased of Mr. Guest. *a a*, cells of chicory; *b b*, fragments containing numerous starch corpuscles; *c c*, separate starch granules; *d d*, portions of a brown membrane, without apparent organisation, very commonly observed, and derived from the testæ of the seed.

From an examination of the analyses contained in the above Table, it appea

1st. That *Eleven or one-half of the samples were adulterated.*
2nd. That *Four of the chicory-powders were adulterated with Roasted Wh*
3rd. That *ground Acorns were present in an equal number of cases.*
4th. That *two of the samples contained Sawdust, and one Mahogany Saw*
5th. That *Mangel-wurzel was detected in one of the chicories.*
6th. That *in one instance roasted Carrot was present.*

In our first Report on chicory we gave the results of the analysis of thi four samples, from which it appeared —

1st. That *Fourteen of the samples were adulterated.*
2nd. That *in Nine the adulteration consisted of roasted Corn.*
3rd. That *scorched Beans were present in Four of the samples.*
4th. That *in One case ground Acorn was detected.*

As we remarked on a previous occasion, we do not charge these adulterat upon the dealers: we are fully aware, that in most cases the manufacturers the guilty parties. The dealers, however, are much to blame in purchasi manufactured article in the state of powder, which they must know, from prices usually paid for it, cannot be genuine.

If those grocers whose chicory we have analysed and found to be adulter wish to stand well before the public, and desire to show that they have participation in the dishonest practices disclosed, they will forward to us publication the names and addresses of the manufacturers from whom purchase the chicory-powder, together with the assurance that they were aware that the chicory they were selling was adulterated. In this way m good would be effected, and the several frauds detected traced to their sourc

In particular, it behoves Mr. Munday and Messrs. Hawkins and Co. to m known in what way the chicory adulterated with mahogany sawdust came their possession, so that the perpetrators of so scandalous and disgracef fraud may be discovered.

We have in our possession numerous samples of adulterated chicory-pow together with the names of the manufacturers by whom they were prepa ut as these have not been procured in such a way as to authorise the publi- ation of the names, we refrain from announcing them at present, preferring to ry the effect of the proposition contained in the previous paragraphs.

We have, in previous articles, fully considered the subject of the adulteration f coffee with chicory, and we shall now merely offer a few additional remarks.

The law, as we are all aware, sanctions the adulteration of coffee with chicory, to the injury of the revenue and the loss of the public in health and pocket. This same law, however, does not permit the adulteration of coffee with corched wheat, beans, carrots, &c., but subjects parties practising these de- eptions to prosecution, and, in case of conviction, heavy penalties. Such, at east, is the law, but under the present government it is useless and dead-letter aw, since, notwithstanding the prevalence of these adulterations, it is never nforced.

But, singular to say, the law, while it provides in word against certain of the dulterations to which coffee is liable, is silent with respect to the adulteration f chicory; so that that which is an offence in the case of coffee, is not illegal in hat of chicory, with which the manufacturers may mix corn, beans, carrots, angel-wurzel, mahogany sawdust, &c., and yet not violate the excise laws; is, to say the least, is grossly inconsistent.

In our first Report on chicory we treated of the properties of that production. e stated that the recent root is described in our best works on Materia Medica aperient and diuretic. We showed, also, by experiment, that the roasted ot, even when mixed with coffee, in some persons excited diarrhœa.

These facts are in themselves sufficient to condemn the indiscriminate use of icory as an article of diet.

The great increase which is known to have taken place of late years in the equency of renal disorders, is possibly to be found in the increased con- mption of chicory root.

But there is good reason to believe that chicory, from its narcotic character, o exerts injurious effects on the nervous system; so convinced of this is that lebrated German oculist, Professor Beer of Vienna, that he has enumerated icory-coffee as among the causes of amaurotic blindness.

We recommend the above facts to the careful consideration of the chicory- amoured Chancellor.

We now postpone for a short time, further disclosures connected with the farious system which prevails so extensively in the adulteration of coffee and icory.

HE ANALYTICAL SANITARY COMMISSION, MR. BACK, & MR. TEETGEN.

To the Editor of The Lancet.

Sir,—In your number of The Lancet of the 10th inst, under the head of e "Analytical Sanitary Commission—Chicory and its Adulterations, (Second port,)" appears the following:—

14th Sample.—Purchased of G. W. Back, 137. Whitechapel-road. Adulterated—with a very considerable quantity of roasted wheat farina."

Immediately upon my attention being directed to this charge against me, I mmunicated with Messrs. Barry and Co., of Type-street, Finsbury, the firm om whom I have for some years past, and do still, purchase my chicory, and ho a short time since furnished me with a written assurance and guarantee in e following words, which I take from their letter now in my possession:—

"We deem it right to say, that all chicory sold by us we hold ourselves tirely responsible for its being genuine, and will guarantee all our customers, the use of it, against any charges that may be made."

At my interview with Messrs. Barry, I handed them The Lancet, and said, Gentlemen, I now call upon you to vindicate my character, which you know, well as I feel it to be, is that of an honourable and respectable tradesman; d I assure you, (as I likewise do you, Mr. Editor,) that never at any time ice I have been in business have I adulterated or mixed anything whatever, any way, with my chicory; but that I have always sold it precisely in the me state as it comes into my shop; and this I am in a condition to prove in the clearest possible manner, and also that I never had such a thing as wheat farina in my possession.

Messrs. Barry, having the fullest conviction of the truth of my statement, at once declared their desire to render every assistance in their power to refute the charge you have made against me; and I have since received a letter from them, dated the 12th inst., from which I extract the following:—

"With regard to the statement in The Lancet, that the chicory purchased of you contained a considerable quantity of wheat farina, if you are prepared to show that it was sold by you as received from us, we are willing to see the Editor of The Lancet with you upon the subject, or to render any assistance you may require to refute the charge."

Now, Sir, I can show, to the satisfaction of any jury, that I have always sold chicory precisely in the same state as delivered to me by Messrs. Barry; and as I have the fullest confidence in their integrity, I think it right to add, that the charge made by you, in last week's edition of The Lancet, cannot be well founded.

I request that, in fairness to me, which I am sure I shall meet at your hands, you will insert this letter in your next publication; but if, in the meantime, you think Messrs. Barry's suggestion of an interview, or any other course, desirable, I shall be only too anxious to render every assistance.

I am, Sir, your obedient servant,

Britannia Tea Warehouse, 137. Whitechapel-road, May 13. 1851. G. W. Back.

⁂ The contents of this letter are strongly indicative of the integrity and strict propriety of conduct which Mr. Back has pursued; and far be it from us to impeach, in any way, the accuracy of the statement made by Messrs. Barry. Still it is evident that allegations which clash so strongly with the report of our commission demand a searching inquiry. The commissioner, therefore, who made the examination, will place himself in immediate communication with Mr. Back and Messrs. Barry; and in this case also the result of a further analytical investigation shall be announced in our columns.—Ed. L.

"The following letter has been received by us from Mr. Teetgen:"—

To the Editor of The Lancet.

Sir,—In a number of your publication, issued on May 10th, I find my name there mentioned as selling chicory adulterated with acorns. In justice to myself, I therefore beg to state exactly how I manage the coffee and chicory portion of my business, and you will then have an opportunity of judging, and give the public an opportunity of judging also, whether I do not do all I can in my power to sell a *good* and *genuine* artcle. My coffee I buy of the first houses, and of the best quality I can get. My chicory I buy in two ways. The *principal* part I buy in the *raw state*, and of the *choicest* in *the market;* this I have roasted and *nibbed* by the best man I can find, and mix it with my coffee, and have both ground together. *This* kind forms the *principal* part of my chicory trade. I send occasionally to Taylor Brothers, Brick-lane, for twenty-eight or fifty-six pounds of *ground* chicory, as it very much blunts the coffee-mill to grind chicory alone. This is sold when *ground* chicory is asked for, and never mixed with any coffee. I have here sent you Taylor Brothers' invoices, and a sample of the ground chicory bought of them, and also a sample of my chicory nibs. I endeavour to do all I can to get the *best articles* of each kind, and what can any man do more?

In order that your publication above referred to may not *unjustly* injure my reputation and business, I now beg the favour that you will insert in your next *number* the *whole* of this letter; and I *further most particularly beg of you or your commissioners, or all of you, to visit and inspect the whole of my stock and business*, and then I will ask you if I can do more to secure a good article. Will you also be good enough to let me know *which* of the two samples now *sent* is like the *one* you purchased at my shop?

For the sake of honesty and *justice to all parties*, I hope you will afford every *facility* to respectable tradesmen to maintain their reputation unspotted. Your publication has of late contained names of some of the most respectable men in the trade, such as Messrs. Hawkins and Co., Mr. Abbiss, &c., whose acquaintance I have the pleasure to possess; and it really appears a sad thing that

honest members of society should be injured by statements which
y explaining.—I am, Sir,

Your most obedient servant,

techapel Road, May 17. 1850.

A. Teetgen.

ng further arose out of either of the above cases. At an interview between
missioner and Mr. Back, it was arranged that the samples should be
d to microscopical examination by impartial and independent micro-
Although such was the arrangement, up to this time it has not been
nto effect, and this not through backwardness on our part.

COCOA, AND ITS ADULTERATIONS.

is prepared from the seeds of Theobroma Cacao, which is cultivated
in the West Indies, and parts of South America.

eeds are enclosed in pods several inches in length, and are arranged
and attached to a central axis; each pod includes a considerable number
, from twenty to thirty, and in some cases even more. They resemble,
at, in shape, almonds, but are about twice as large.

e are several varieties of cocoa, named after the places from which they
cured: the three principal are, Trinidad, Maragnon, and Bahia cocoas.
e the Trinidad is the best, and the Bahia the least valuable; the latter
distinguished by the smoothness of the seeds and their bright red colour.

re, in his "Dictionary of Arts, Manufactures, and Mines," gives the
g particulars in reference to cocoa and chocolate:—

ocolate is an alimentary preparation of very ancient use in Mexico, from
ountry it was introduced into Europe by the Spaniards in the year 1520,
them long kept a secret from the rest of the world. Linnæus was so
it, that he gave the specific name *theobroma*, food of the gods, to the
ree which produced it. The cacao beans lie in a fruit somewhat like a
er, about five inches long, and three inches and a half thick, which con-
om twenty to thirty beans, arranged in five regular rows, with partitions
, and which are surrounded with a rose-coloured spongy substance, like
water-melons. There are fruits, however, so large as to contain from
fifty beans. Those grown in the West India Islands, Berbice and De-
, are much smaller, and have only from six to fifteen; their development
ess perfect than in South America. After the maturation of the fruit,
heir green colour has changed to a dark yellow, they are plucked, opened,
eans cleared of the marrowy substance, and spread out to dry in the air.
monds they are covered with a thin skin, or husk. In the West Indies
e immediately packed up for the market when they are dried; but in the
as they are subjected to a species of slight fermentation, by putting them
bs or chests, covering them with boards or stones, and turning them over
norning to equalise the operation. They emit a good deal of moisture,
e natural bitterness and acrimony of their taste by this process, as well as
f their weight. Instead of wooden tubs, pits, or trenches dug in the
, are sometimes had recourse to for curing the beans — an operation
earthing (*terrer*). They are lastly exposed to the sun, and dried. The
kind are reckoned the best, being larger, rougher, of a darker brown
and, when roasted, throw off their husks readily, and split into several
ar fragments; they have an agreeable mild bitterish taste, without acri-
The Guiana and West India sort are smaller, flatter, smoother-skinned,
-coloured, more sharp and bitter to the taste. They answer best for the
ion of the butter of cacao, but afford a less aromatic and agreeable cho-
The fatty matter is of the consistence of tallow, white, of a mild agree-
ste, called butter of cacao, and not apt to turn rancid by keeping. It
nly at 122° Fahr., and should therefore make tolerable candles. It is
in boiling alcohol, but precipitates in the cold. It is obtained by ex-
the beans to strong pressure in canvas bags, after they have been steamed
ed in boiling water for some time. From five to six ounces of butter
thus obtained from a pound of cacao. It has a reddish tinge when first
ed, but it becomes white by boiling with water.

"The beans, being freed from all spoiled and mouldy portions, are gently roasted over a fire in an iron cylinder, with holes in its ends for allo the vapours to escape, the apparatus being similar to a coffee-roaster. W the aroma begins to be well developed, the roasting is known to be finis and the beans must be turned out, cooled, and freed, by fanning and sift from their husks."

COMPOSITION OF COCOA.

The following is the composition of 100 parts of the seeds of West I cocoa, deprived of husk, according to Lampedius :—

Fatty matter	53·10
Albuminous brown matter, containing the aroma of the bean	16·70
Starch	10·91
Gum	7·75
Lignine	0·90
Red pigment	2·01
Water	5·20
Loss	3·43
	100·00 parts.

The above analysis is very nearly accurate, but we believe that the proporti of starch is somewhat underrated.

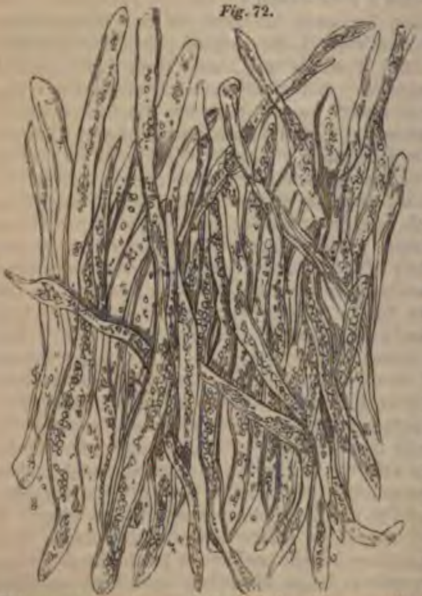
It is evident, then, that the nutritive properties of cocoa are very great, that from the quantity of fatty matter present, it is especially adapted to maintenance of respiration, and the temperature of the body, as well as to development of fat.

When genuine, cocoa is a very wholesome as well as nutritious article diet, and one which ought to be more generally employed. Cocoa conta theine, the active principle of tea.

The shells, or husks, form about twelve per cent. of the weight of the bea they contain but little fat, much lignine, and some mucilage.

STRUCTURE OF THE COCOA-SEED.

Fig. 72.



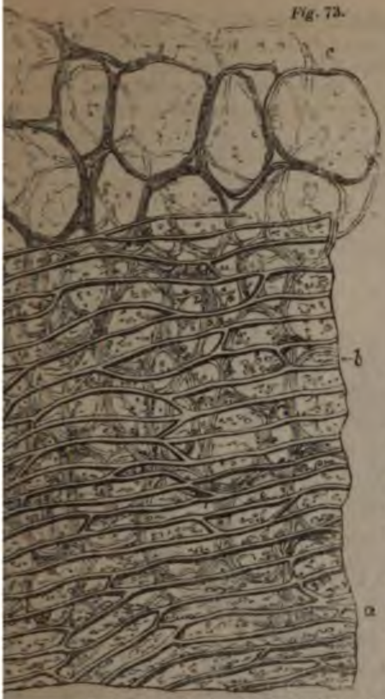
This engraving represents the *tubular fibres* usually observed in greater or less numbers on the surface of the COCOA-SEED. The fibres are magnified 100 diameters.

It is of very great importance the minute structure of all vegeta substances employed in food and dicine should be thoroughly und stood; for without such knowle it is quite impossible to detect adulterations to which the majorit these substances are liable.

The structure of the seed, or be as it is sometimes called, of the coc is very characteristic, although so what complicated : in it, as in o seeds, two parts require to be dis guished, the shell or husk, and seed proper.

The first structure noticed on surface of the husk, consists of a c siderable number of *tubular fibre* large size, and containing granu matter and minute corpuscles; are more abundant on some se than others, and do not appear form part of the seed itself, but belong rather to the seed-vessel, are probably derived from the spo substance which surrounds the se when unripe : the fibres for the m part run parallel to each other in course of the long axis of the see

Fig. 73.



represents the *two outer tunics of the husk of the seed* ther with the *enlarged and mucilage-bearing cells.* brane; *b*, second tunic; *c*, mucilage cells. This as the three following, are magnified 220 diameters.

The *husk* may be separated into three or four distinct tunics or membranes.

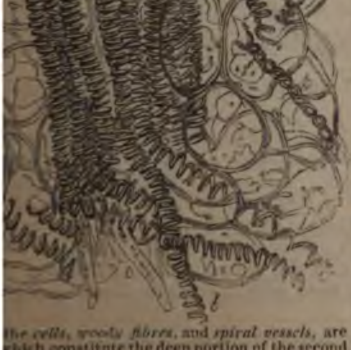
The *first or outer membrane* consists of elongated cells, adapted to each other, and disposed in a single layer, with their long diameters placed transversely to the axis of the seed.

The *second tunic* is constituted of large angular cells, superimposed in several closely connected layers; towards the centre of the membrane formed by them the cells increase greatly in size, their parietes become thin and diaphanous, and their cavities filled with a mucilaginous substance, which, in seeds soaked in water for some hours, is seen to be considerable in quantity.

These two membranes, together with the enlarged cells, are delineated in the accompanying woodcut.

As the cells forming the second membrane approach the surface of the seed, they lose their mucilaginous character, become smaller, and return to their original size.

Fig. 74.



the *cells, woody fibres*, and *spiral vessels*, are which constitute the deep portion of the second

If now the surface of an entire seed enclosed in its membrane be examined, several raised lines or fibres will be observed, commencing at the end of the seed attached to the seed-vessel, spreading themselves out over its surface, and terminating at the distal extremity of the seed: these fibres are composed of spiral vessels, which lie imbedded in fibres of woody tissue and the cells above described.

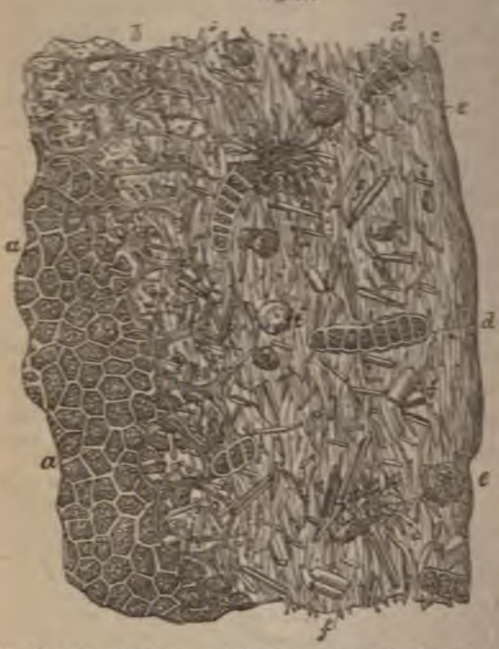
The second membrane forms the chief substance and thickness of the husk.

The *third* membrane, thin and delicate, consists of angular cells of small size, the cavities of which contain minute globules of fat; in removing the outer tunics this membrane sometimes comes away in part with them, but in general the greater portion adheres to the surface of the seed. This membrane covers not only the outer surface of the lobes of the seed, but also dips down between them, and furnishes each of the opposite sides with a covering; it is most however, on the external surface. It is probable, notwithstanding it exhibited as a separate tunic, that it is yet, strictly speaking, not to be as a distinct structure, but that it really belongs to the seed, since on r it cells belonging to the substance of the seed frequently come away the colourless cells constituting it being evidently gradually transfor the coloured ones of the seed itself. To each seed-lobe, therefore, a to the above description, there is a distinct membrane.

Situated in the interspaces of the lobes is a fourth structure, externally to the second membrane, the cells forming which pass do it for a short distance; although clear and transparent, it exhibits structure, and on its a considerable nu small crystals are al be seen, consisting of margarine, as well elongated bodies, ro either extremity, and into several compart cells, and which do no to be attached to th brane on which From their curious ance, and the absence nexion with any of t structures of the coc the observer is led to that they are ext growths, probably We have detected every sample of co submitted to exam (See *fig.* 75.)

We have now co the description of the structures which en the composition of t of cocoa: this, alth contains scarcely any no starch, and is t but little nutritive, present in almost ev ple of flake, rock, a less-carefully manu preparations of coco

Fig. 73.



In this engraving the several structures above noticed are delineated. *a, third tunic; b, rounded cells*, derived from the second membrane, lying upon the fourth membrane, and situated at the lines of junction of the lobe; *c, fourth or fibrous membrane; d d, elongated bodies; e e, rounded masses of crystalline atty matter; f f, crystals of margarine.*

The French chocol nufacturers, howeve make use of the husk, but generally dispose of it, obtaining about thr per pound.

The greater part of the rejected and comparatively worthless husks fi way to Ireland.

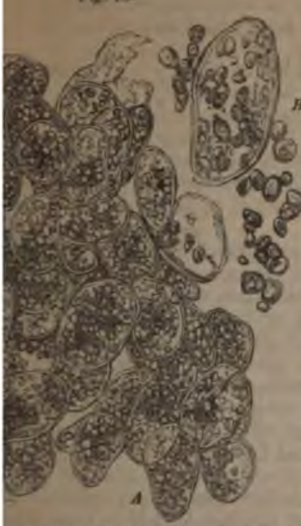
Of these husks, Dr. Ure states 612,123 lbs., out of 753,580 imported sumption in 1840, were consumed in Ireland, and less than 4000 lbs. o beans.

There is reason to believe that in some cases the fragments of hus irritating to the intestines, and occasion diarrhœa.

The *seed*, deprived of its husk, is seen to be composed of severa angular in form, and irregular in size and shape; under pressure, these separate from each other, and the seed breaks up into pieces, which ar as "nibs."

The lobes are constituted of innumerable minute cells, of a rounded f cavities of which are filled with starch-corpuscles and fatty matter.

Fig. 76.



ſents the *cells* which form the kernel
n *A*, the cells and contained starch-
magnified 220 diameters; and in *B*,

On the surface of the seed these cells become angular by compression, and are usually of a deep-red colour: the tint, however, varies greatly; they are frequently, in parts, spotted with purple, and even deep-blue.

Each cell contains many starch-corpuscles, small in size, of a rounded form, and which often present an obscure, radiate, or stellate hilum.

Placed at one extremity of the seed is the *embryo;* this consists of cellular tissue, the cells or meshes of which enclose numerous starch-granules and spherules of oil.

Now, in the more carefully prepared chocolates, the whole of the structures represented in *figs.* 72, 73, & 74. are absent, and those delineated in *fig.* 75., and especially *fig.* 76., only are met with: in some cases the embryo even is removed; but this, since it forms so inconsiderable a part of the entire seed, and contains, moreover, starch and fat, appears to be almost an over-refinement.

ON THE ADULTERATION OF COCOA.

ntry cocoa is sold under the names flake, rock, granulated, soluble,
œopathic cocoa, &c.

is nothing in these names to indicate that the articles in question
more than varieties of cocoa, or to show, what is too frequently the
ey are compounds of sugar, starch, cocoa, and oftentimes other sub-

ice of calling these *mixed* articles COCOA is manifestly as improper
e as it is to call *the compound of coffee and chicory*, Patent Com-
e, Finest Old Turkey Coffee, &c.

ch and other continental manufacturers of cocoa adopt a more
rd and proper course: they never call their compound and manu-
cles cocoa, but chocolate; thus they even denominate the cakes
repare, and which contain nothing but cocoa, chocolate—"chocolat
although, with strict propriety, they might in this case have used
oa.

, then, of the English makers in general is not cocoa at all, but cho-
ever, therefore, the word cocoa, an adjective of indefinite significa-
refixed, is employed to designate an article which is not pure or
a, *we shall consider and describe that article as adulterated*—a
is suggested by common sense.

of Accum, Brande, Ure, and Pereira, contain but little information
e adulteration of cocoa; the only English writers who have treated
lly being Mitchell and Normandy.

f these authors, Mitchell, has the following observations on the sub-

e is adulterated with flour, potato-starch, and sugar, together with
, lard, or even tallow. Even the so-called finest chocolate is made
ied mutton-suet and common sugar, together with ordinary cocoa.
aking chocolate it is gravelly,—if it melt in the mouth without
l, refreshing taste,—if it, on the addition of hot water, becomes
ty,—and, lastly, if it form a gelatinous mass on cooling, it is adul-
tarch and such-like substances.

"Where earthy and other solid substances are deposited from choco with water, either the beans have not been well cleansed, inferior suga employed, or mineral substances have been added to it, either for the colouring or of increasing its weight.

"Moreover, when chocolate has a kind of cheesy taste, animal fat added; and when very rancid, either vegetable oil, or even the se selves, have been employed in the sophistication.

"The mineral substances employed in the making up of chocolate a the ochres, both red and yellow, together with minium (red lead), sulphate of lime, chalk, &c. Chocolate so adulterated, more especiall preparations of lead, are highly injurious; it is, however, only the in colates that are thus adulterated."

From the work of Normandy we extract the following remarks:—

"Unfortunately, however, many of the preparations of the cocoa under the names of chocolate, of cocoa flakes, and of chocolate powd of a most disgusting mixture of bad or musty cocoa-nuts, with th coarse sugar of the very lowest quality, ground with potato-starch, o cuits, coarse branny flour, animal fat (generally tallow, or even gr have known cocoa-powder made of potato-starch, moistened with a d cocoa-nut shells, and sweetened with treacle; chocolate made of the terials, with the additions of tallow and of ochre. I have also met w late in which brick-dust or red-ochre had been introduced to the exten per cent.; another sample contained twenty-two per cent. of peroxi the rest being starch, cocoa-nuts with their shells, and tallow. Me Garnier and Harel assert that cinnabar and red-lead have been found samples of chocolate, and that serious accidents had been caused b bolical adulteration. Genuine chocolate is of a dark brown colour; has been adulterated is generally redder, though this brighter hue is given to excellent chocolate, especially in Spain, by means of a lit This addition is unobjectionable, provided the annato is pure, which is not always the case."

In the above quotations mention is made of the chief adulteratio cocoa is subject; we will therefore proceed to consider the method they may be detected.

On the Detection of Foreign Fatty Matter.

Animal oils and fats, on exposure to the air for a time, become disagreeable to the taste; for their detection, therefore, it is recomm the suspected cocoa should be spread out, and subjected to the ac atmosphere.

"The adulterations by lard, tallow, oils, and suet," writes Mitchell detected by the taste, after the chocolate has been exposed for some action of the air in a tolerably warm place. In order to effect the desi rapidly, the chocolate should be scraped very fine, and spread out u or piece of paper. In a few days the foreign fatty matters will beco and can then be detected by the peculiarly disagreeable taste and s fatty substances in that condition possess."

"The presence of *animal fats*," states Normandy, "may be dete palate, for the chocolate generally has, in that case, a cheesy flavour common butter or oil has been added, it has a rancid flavour. T characteristic, for butter of cocoa always remains perfectly sweet.

"The presence of *animal fats*, or of *oils*, may also be recognised fying a portion of the chocolate as follows:—Rasp about 2000 gr chocolate under examination, and boil them with water and some cau When the fat has saponified, dilute the mass with a sufficient quantit and filter three or four times. The milky filtrate, which is, in fact, a soap, should now be supersaturated with nitric acid; this will separ which will float on the liquor after cooling. It may then be collected and on rubbing a small portion of it between the fingers, the odour wi indicate its origin; but more effectually still by heating it in a sm Pure butter of cocoa has no odour. Or the chocolate may be exhaus uric ether, and by evaporating it, the fat will be left behind, and may then be entified, as just said."

The methods of detection pointed out in the above paragraphs are not without actical value ; we believe, however, that the presence of foreign fatty matter ay frequently be determined with considerable ease and certainty, in the fol- wing manner : —

The quantity of fat present in any sample of cocoa of given weight is to ascertained by boiling, and the size and form of the concrete fat-globules ich form on the surface of the decoction when cold noticed.

One half-ounce of genuine Trinidad cocoa, prepared from the kernels only, d boiled for ten minutes with ten ounces of water, yields about sixty-five ains of concrete fat.

The same quantity of genuine flaked cocoa, which contains both kernels and sk, boiled for the same period, yields about forty grains.

When, therefore, a sample of cocoa, treated as above, is found to contain a ater proportion of fat, there is no question, if the excess be at all consider- le, and amount to several grains, that foreign fatty matter has been mixed with e cocoa.

But in some cases there may be no excess of fat, and even a deficiency, and animal oil or fat may have been added to the cocoa—circumstances suf- iently explained by the fact, that in many adulterated samples sugar, starch, d a small proportion of animal fat, are frequently made to supply, to a great ent, the place of cocoa.

In all cases in which the presence of animal oil or fat is suspected, not only ould the quantity of fat present be determined, but the number, size, and m of the fat globules and discs which collect on the surface of a cup of cocoa en cold should be noted ; if these be numerous, firm, shot-like, and globular, ept on the upper surface, which is slightly flattened, and very small, rarely ceeding the twelfth of an inch in diameter, then there is no doubt but that e globules in question consist of the fat or butter proper to cocoa.

If, however, on the other hand, the globules be large, flat, or disc-like, exceed e size considerably, attaining, some of them, to one-fourth of an inch, and en more in diameter, then animal fat or oil is probably present, a conclusion ich may be still further confirmed by testing the fat, keeping it for a time, d observing whether it becomes rancid or not. The suspected cocoa should cooled in an open vessel exposed freely to the air, and not in a saucepan with lid on, for in this latter case the droplets of oil of even pure cocoa will fre- ently concrete in large and flattened discs.

Cocoa as ordinarily met with is mixed with variable, and often very consider- le, quantities of sugar and starch. In order to ascertain whether the presence these substances modifies in any way the quantity of oil which collects on the rface, or the size and form of the globules, we instituted the following trials or periments.

One ounce of a mixture consisting of equal parts of genuine cocoa and white gar were boiled for ten minutes in ten ounces of water; the globules of oil ich formed on the surface of the fluid when cold did not differ materially in e and shape from those which occurred on the decoction of pure cocoa, but ere were fewer of them, and the quantity of oil was not so great by a few ains.

The same quantity of a mixture consisting of three parts of cocoa and one of tato-flour was treated in a similar manner; in this case the quantity of fat ich rose to the surface was much less than in the former case, and the globules oil smaller.

It is thus evident that the presence of neither sugar nor starch modifies very nsiderably the size and form of the fatty globules of cocoa, although less fat, pecially when starch is used, collects on the surface.

On the Detection of Starch.

For the detection of starch we are recommended to make use of iodine. Now ose who give this recommendation surely cannot be aware of the fact that the coa-seeds contain certainly not less than 11 per cent. of starch, and therefore that this re-agent, if properly applied, invariably shows the presence of starch in every sample of cocoa, even the most genuine. But little reliance, therefore, ought to be placed on iodine for the detection of this adulteration, and those not aware that starch exists in cocoa might be led by its use into serious error.

It is not a little remarkable that those who advise the use of iodine make no reference, although their works were published within the last year or so, to the microscope as a means of detecting starch in cocoa, and yet this instrument is capable, not only of affording a good idea of the amount of starch present, but enables the observer to discriminate the several kinds of starch from each other, and to say whether wheat, potato, sago, or arrow-root starch, has been employed in the adulteration.

In determining the quantity of starch present in any sample of cocoa, it is well not to rely solely upon the microscope, but to observe the consistency of the decoction when cold; if the amount of starch be very considerable, forty or fifty per cent., the liquid will be thick and jelly-like.

In making observations on the comparative density of cold decoctions of cocoa containing different per-centages of starch, we noticed that after a time the starch ceased to be uniformly diffused throughout the fluid, and that it, as well as the heavier particles of cocoa, subsided, leaving a supernatant stratum of clear liquid; this stratum varying in thickness according to the quantity of starch present, and being most shallow where there was most fecula, and deepest where this was least.

It then occurred to us that in the fact of the subsidence of the starch we had a means of determining with considerable precision the per-centage of that substance present in any sample of cocoa.

We accordingly filled five tubular glasses, each seven inches and a half in height, three-fourths of an inch in diameter, and holding twelve drachms of water, with five different cold decoctions of cocoa, containing, respectively, 50, 40, 30, 20, and 10 per cent. each of starch; in the first, the thickness of the clear stratum was one inch; in the second, one inch and a half; in the third, two inches; in the fourth, two inches and a half; and in the fifth, three inches. It is to be understood, however, that these measurements are approximately correct only, and that to obtain perfectly accurate results it is necessary that the experiments should be carefully repeated. The proportion of the ingredients forming each decoction was 220 grains by weight of the mixture of cocoa and potato flour, to eight ounces of water, the boiling being continued for five minutes in each case.

Should the cocoa contain sugar as well as starch, this must be first removed, by means of cold distilled water, and its amount ascertained.

The specific gravity of the decoction also enables us to form an approximate opinion as to the amount of starch present; this of course being greatest where there is most fecula.

Mr. Mitchell gives the following directions for the detection of starch in cocoa, from which it is clear that he was not aware that the seeds naturally contain a considerable quantity of starch: —

"Act upon about half an ounce of the suspected chocolate with a teacupful of more of hot water. Mix all well together in a mortar, and set aside to cool when cold, add a few drops of a solution of iodine in water (prepared as described under the article Flour). If starch or flour be present, or ground beans or peas, or any substance containing starch, a blue coloration will occur This coloration will be intense in proportion to the quantity of starch present If only a very small quantity of starch be present, it will be advisable to strain the mixture of chocolate and water through a linen cloth, and act on the strained liquid with the solution of iodine. An alcoholic solution of iodine is also suited to this purpose. If the chocolate acted on be pure, only a yellowish-brown coloration will take place."

The directions by Normandy are more brief, but to the same purpose: —

"Genuine chocolate should dissolve in the mouth without grittiness; it should leave a peculiar sensation of freshness, and after boiling it with water the emulsion should not form a jelly when cold; if it does, starch or flour is present *The admixture* of flour or of starch, moreover, may be readily detected by the e colour which is imparted to the decoction, after cooling, by solution of ime."

rhaps the best method of proceeding in order to determine the amount of rch present is to boil the cocoa thoroughly, the sugar having first been sepa-ed; strain the decoction and remove the fat when cold; the residue will con-t principally of starch.

ON THE DETECTION OF SUGAR.

The presence of sugar in cocoa may be readily detected by the taste. To ermine the quantity, the following simple but efficient proceeding may be pted: — Dissolve a weighed quantity of cocoa containing sugar in cold water, er, dry the residue by means of blotting paper and heat, weigh; the loss will icate very nearly the amount of sugar with which the sample of cocoa erated upon was admixed.

To show to what extent this method may be relied upon, we may mention at we dissolved one ounce of a mixture in equal proportions of cocoa and gar in cold water, and afterwards dried the residue; the weight of this was y twenty-eight grains short of the four drachms.

ON THE DETECTION OF MINERAL SUBSTANCES.

Of the mineral substances employed in the adulteration of cocoa, some are d for the sake of their weight; of these the chief are carbonate of lime or alk, and sulphate of lime or plaster of Paris, and especially the former.

Other substances are employed for the colour they impart, and these are fre-ently had recourse to; the principal are red earth, red ochre, or Venetian d.

For the detection of these earths, an ounce of each of the samples of cocoas to analysed should be incinerated, and the ash weighed and tested.

If chalk or carbonate of lime be present, an effervescence will ensue on the plication of a mineral acid.

If the presence of any of the red earths be suspected, the ash will be more or s deeply coloured and ferruginous from the presence of iron, for which it ay be tested; for this purpose it should first be treated with hydrochloric acid; s should afterwards be diluted, and the proper re-agents applied.

Mitchell gives the following directions for the detection of earthy matters: —

" A considerable quantity of the suspected chocolate must be treated with ccessive portions of hot water, as long as anything seems to be dissolved. The st method of operating is as follows: —

" The finely-scraped chocolate (say a quarter of a pound) is placed in a large ssel, and two or three quarts of warm water poured upon it, and the whole ll stirred. After about a quarter of an hour, the supernatant liquid may be ured off, and the residual matter again treated with hot water, until nearly steless. It is now to be collected, dried, and tested."

Under this head Normandy has the following observations: —

" *Brick-dust*, and other *earthy matters*, are detected by incinerating a given ight of the chocolate or cocoa under examination; the impurities remain ong the ashes, and may be easily recognised. This adulteration is also readily tected by grating 500 grains of the chocolate in as fine a powder as possible, owing it into about half a pint of cold water, stirring the whole briskly for out ten minutes, leaving it at rest for about two minutes, and decanting the pernatant liquor. The earthy matter will then have subsided, and will be left sediment."

SULTS OF THE MICROSCOPICAL AND CHEMICAL EXAMINATION OF NUMEROUS SAMPLES OF FLAKE, GRANULATED, ROCK, SOLUBLE, DIETETIC, HOMŒO-PATHIC, AND OTHER COCOAS.

In the following analyses our object has been, to ascertain, approximately, e per-centage of starch, sugar, and cocoa, present in each sample of cocoa bmitted to examination, as well as the different kinds of starch employed.

The correct determination of these important particulars involves the e penditure of a considerable amount of time, and requires much careful obs vation.

For these reasons our inquiries have not been directed, on the present o casion, to the detection of the mineral ingredients sometimes employed in t adulteration and colouring of cocoa. The requisite analyses for the discove of these will be undertaken hereafter, and the results announced in a futu report.

It has already been stated that when the quantity of starch contained in wa is not sufficient, after boiling, to cause the gelatinisation of the whole liquid, gradually separates, subsides, and forms a precipitate, greater or less, depend on the amount of starch present.

By the observation of this fact, we are furnished with the means by which t per-centage of starch contained in any sample of cocoa may be approxima ascertained.

For this purpose, a weighed quantity of the mixture of starch and cocoa, pr viously freed from sugar by washing, must be boiled in a known bulk of wa the decoction being poured, while hot, into a tall, narrow, cylindrical test-gla having lines marked upon it, indicating different per-centages.

The scale denoting the per-centages must be previously determined by ca fully conducted experiments, the particulars of which it is not necessary detail, since the principle by which they may be worked out has been stated viz., the subsidence of the starch in water, when not present in too gr amount.

In the first part of this Report it was likewise stated that cold water acts slightly upon cocoa, so that after it has been immersed in that fluid for so minutes, on being re-collected, dried, and weighed, it will be found to h suffered but little loss.

Thus, of four different samples of genuine cocoa, the diminution of wei amounted in each case to only about three grains per cent.: the knowledge this fact at once points out a simple and efficient way by which the quantity sugar contained in any sample of cocoa may be determined. The loss of we which the sample sustains, then, through the action of cold water, over three grains, represents the amount of sugar present. To be on the safe si however, in the following analyses we have allowed, for loss, five grains cocoa in every hundred.

By substracting the combined weight of the starch and sugar, the relati amounts of which have been ascertained by the processes above described, fr a given quantity of cocoa, we are enabled to determine the per-centage of latter, presuming the sample under analysis to consist only of the three ingr dients referred to.

The method ordinarily recommended to be pursued for the detection animal fat, is to expose the suspected cocoa to the action of air and moist when, if it become rancid, it is considered to be adulterated with either la suet, or tallow.

We, however, are disposed to place more reliance on the size and form the concrete fat-globules which collect on the surface of a decoction of cocoa.

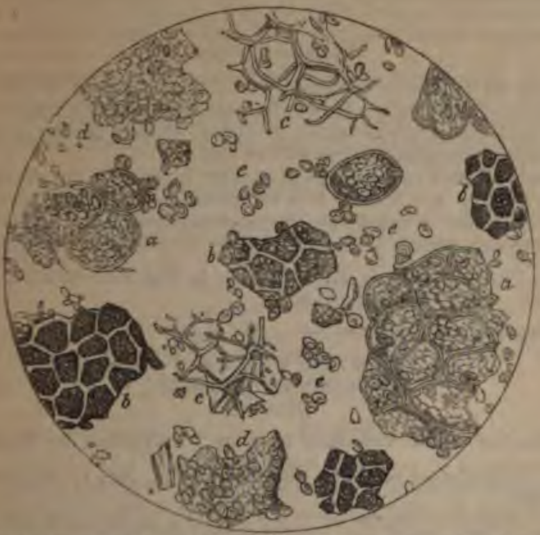
The oil-globules, when concrete, of genuine cocoa, are small, firm, and rou or shot-like, except on the upper surface, which is sometimes slightly flatte

In the cocoa adulterated with animal oil, the globules which form on surface are much larger, and flat and lenticular in shape.

We have already stated that the quantity of oil which rises to the surface a decoction of cocoa containing sugar or starch, especially the latter, is mu less than in the case of pure cocoa, but that these substances do not appear affect in any considerable degree the size or form of the fat-globules, consequently do not render the test we have pointed out of less value.

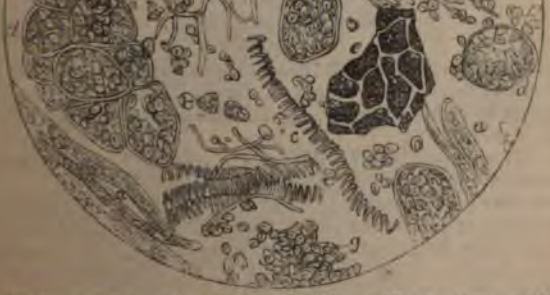
As we shall hereafter insert representations of the microscopic appearan presented by cocoas, containing different kinds of starch, in order that the may be the more readily comprehended, we call attention to the two followi woodcuts :—

Fig. 77.



Represents the structures met with in a sample of GENUINE TRINIDAD COCOA, prepared by *M. Lebaigue.* It will be noticed that *the tissues forming the husk of cocoa are absent*, and that those of the seed itself are much broken up, many of the cells being ruptured, so as to permit the escape of the starch-corpuscles and fat, points of importance in the manufacture of chocolate. *a a*, cells of the kernel of cocoa; *b b*, membrane on surface of lobes; *c c*, tissues of embryo; *d d*, free masses of starch; *e e*, loose starch-corpuscles.

Fig. 78.



Exhibits the structures present in a sample of *unadulterated* FLAKED COCOA, which usually *contains both seed and husk.* *a a*, tubular fibres on surface; *b b*, second membrane of husk; *c c*, spiral vessels; *d d*, cells of kernel; *e*, membrane covering lobes; *f*, tissue of embryo; *g g*, free masses of starch-granules; *h h*, loose starch-corpuscles.

Several kinds of cocoa are manufactured, the chief being flake, granulated soluble, rock, dietetic, homœopathic, broma, &c.; of each of these we shall trea separately.

Flaked Cocoa.

Flake cocoa as generally prepared contains the husk, which forms abou twelve per cent. of the seeds. It is to be regretted that the value of this, one o the simplest and nicest preparations of cocoa, should be lessened by the pre- sence of so much comparatively worthless matter.

While genuine flaked cocoa of good quality cannot be purchased under ten- pence or one shilling per pound, it is no uncommon circumstance to see in th shop-windows samples ticketed fivepence and sixpence per pound; such sampl it is needless to say, at this price, must either be damaged or adulterated.

1st Sample.—Purchased of J. H. Kemper, 1. Waterloo-terrace, Commercial- road East. Price 10*d.* per pound.

Copy of placard in window:—

"Kemper's Pure Cocoa.
Pure, and Warranted
Genuine."

On analysis, the article was found to be as "warranted"—*Genuine.*

2nd Sample.—Purchased of Owen Sparrow & Co., No. 1. Aldgate. Price 8d per pound.

Analysis.—100 parts consist of about 20 parts *sugar*, and the remainin parts of a combination of cocoa and starch, in about the proportion of 18 the latter to 100 of the former, the starch being a mixture of *potato* a *wheat flours.*

3rd Sample.—Purchased of Messrs. Ridgway & Co., 4. & 5. King Willia street, City. Price 10*d.* per pound.

Genuine.

4th Sample.—Purchased of J. Lawrence, 51. High-street, Bloomsbury. Pric 1*s.* per pound.

Genuine.

5th Sample.—Purchased of Hall, South-row, Golden-square. Price 8*d.* p pound.

Analysis.—100 parts consist of nearly 11 parts *sugar*, and the remaini 89 parts of a combination of cocoa and *potato-flour*, in the proportion about 14 of the latter to 100 of the former.

6th Sample.—Purchased of Stevenson & Co., 55. Strutton-ground, Westminst Price 5*d.* per pound.

Copy of placard in window:—

"Flaked Cocoa,
Nutritious and Cheap.
5*d.* per lb."

Analysis.—100 parts consist of about 11 parts *sugar*, and the remaining 8 parts of a combination of cocoa and starch, in the proportion of about 12 the latter to 100 of the former, the starch being a mixture of *wheat, potat* and *sago flours.*

7th Sample.—Purchased of H. Reeves, 6. Great Chapel-street, Broadway Westminster. Price 6*d.* per pound.

Analysis.—100 parts consist of a mixture of cocoa and starch, with a ver small quantity of *sugar*, the starch being in the proportion of about 14 p cent., and being a mixture chiefly of *potato-flour*, with some *sago-meal.*

8th Sample.—Purchased of Waller & Co., 80. Charlotte-street, Tottenha court-road. Price 6*d.* per pound.

Analysis.—100 parts consist of nearly 10 parts *sugar*, and the remaining parts of a combination of cocoa and starch, in the proportion of about 10 the latter to 100 of the former, the starch consisting of *sago-meal* a *wheat-flour.*

th *Sample.*—Purchased of W. Harper, 24. James-street, Lisson-grove. Price 8*d.* per pound.

Analysis.—100 parts consist of about 14 parts *sugar*, the remaining 86 parts of a mixture of cocoa and *potato-flour*, the latter being in the proportion of about 16 parts to 100 of cocoa.

0th *Sample.*—Purchased of W. Strugnell, 109. Edgware-road. Price 10*d.* per pound.

Analysis.—100 parts consist of about 8 parts *sugar*, the remaining 92 parts being nearly all cocoa, with a very small per-centage of *potato-flour*.

Granulated Cocoa.

th *Sample.*— Purchased of Hanks, 27. Ryder's-court.

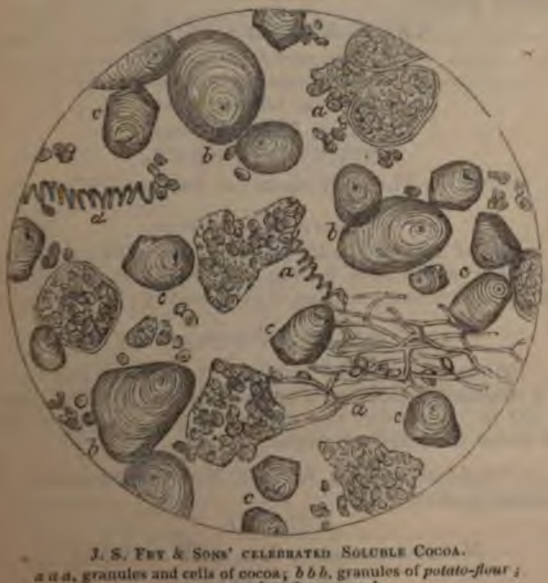
"FRY'S
GRANULATED COCOA.
ITS ADVANTAGES
Are perfect and instantaneous solubility, requiring no
boiling, and fineness of flavour: it is also nutri-
tious and easy of digestion.
MADE BY
Fry & Sons, Bristol.

Directions.

"Fill the cup with boiling water, and sprinkle in one or two teaspoonfuls, give a stir, and use milk or cream and sugar to suit the taste. It may be made in the itchen, as chocolate, by boiling half milk and half water, and when off the fire, irring in one or two ounces to a pint; or it may be milled like other chocolate.
Price, ½ lb. package, 7*d.*"

Analysis.—100 parts consist of about 28 parts *sugar*, and the remaining 72 parts of a combination of cocoa and starch, in the proportion of about 27 of the latter to 100 of the former; the starch being a mixture of *potato-flour*, *Maranta arrow-root*, *sago-meal*, and a few granules of *Curcuma or East Indian arrow-root.*

Fig. 79.



J. S. Fry & Sons' celebrated Soluble Cocoa.
a a a, granules and cells of cocoa; *b b b*, granules of *potato-flour*; *c c c*, granules of *sago-meal*.

12th Sample. — **Purchased of Handford & Davies, 61. High Holborn. Pri** 1*s.* the pound package.

"HANDFORD & DAVIES'S
PURE
GRANULATED COCOA.

ADDRESS TO THE PUBLIC.

"This cocoa has now, for more than two years, been before the public, the large and continually increasing consumption of it is a proof how fully it appreciated. We pledge our reputation that there is *not one atom* of any arti besides cocoa in it, and that the finest in the market. Vast quantities of are sold under the name of soluble cocoa, but which, in fact, is a vile compou of Japan-earth, sago-dust, brown sugar, and cocoa; the price is seductive, bei as low, in some cases, as 6*d.* per lb. and the public think they are purchasing cheap article, when, in truth, they are buying a very dear one — dear, becau in a pound of it there is not frequently half a pound of cocoa, — dear, becau it is decidedly unwholesome, and worse than useless when taken as a restorati of health. The plea that it does not require to be boiled is delusive, for the rection demands that the water with which it is made must boil; if so, why have put the cocoa into the water, and let it boil, as the water will not ta longer to boil because you have put a little cocoa into it, from the fact, pu cocoa only requires to be boiled about ten minutes.

"Those who are directed by their medical men to drink cocoa, for the purp of renovating their strength, we strongly urge to make trial of our pure gra lated cocoa; it is manufactured from the finest Granada nut with the gre care, under a process peculiar to us, and we confidently state that it will found to be more nutritious, easy of digestion, agreeable, and economical th any other cocoa."

Genuine.

BROMA.

13th Sample. — Purchased of — Staniforth, 138. Oxford-street. Price 7½*d.* p quarter-pound packet.

"STRICKLAND'S BROMA,
Prepared from the
TRUE CHOCOLATE NUT,
Made after the Original Receipt.
F. S. ORR, MANUFACTURER,
GREENWICH, KENT.
The only Genuine Broma.

"DIRECTIONS FOR USING.

"Mix one ounce of BROMA with as much cold Milk as will make it int soft Paste, then pour on a pint of boiling Milk-and-Water in equal proportio and boil for about one minute, stirring it occasionally; or may be made witho boiling.

ADD SUGAR AT PLEASURE."

Analysis. — 100 parts consist of about 22 parts *sugar*, and the remaining parts of a combination of cocoa and starch, in the proportion of 55 of th latter to 100 of the former, the starch being a mixture of *tapioca-star Maranta arrow-root*, and *sago-meal.*

14th Sample. — Purchased of G. & W. Law, New Oxford-street. Price 8*d.* p quarter-pound packet.

"BROMA,
MANUFACTURED BY J. S. FRY & SONS,
BRISTOL.

"DIRECTIONS FOR MAKING BROMA.

"Put a large teaspoonful into a teacup; then a small quantity of *boiling* water, mixing the broma well with the spoon; then nearly fill the cup with boiling water; stir it well, and add sugar, with milk or cream to suit the palate."

Analysis. — 100 parts consist of about 24 parts *sugar*, and the remaining parts of a combination of cocoa and starch, in the proportion of about 25 of the latter to 100 of the former, the starch being a mixture of *Maranta arrow-root* with a little *sago-meal*.

15th *Sample.* — Purchased of T. Edridge & Co., No. 1. Oxford-street. Price 4*d.* per quarter-pound packet.

"STRATTON'S
Original
BROMA.
A Genuine
Preparation of the fragrant and
Delicious cream-flavoured Trinidad
COCOA-NUT.
Prepared by the Sole Inventors,
J. W. STRATTON AND CO.,
HOMŒOPATHIC STEAM MILLS, LAMBETH, LONDON.

"This peculiar preparation, like most articles of sterling merit, is constantly being imitated by unprincipled persons, envious of the high reputation we have obtained from upwards of twenty years' extensive practical experience in the manufacture of chocolate, cocoa, broma, &c.

"Each packet bears our signature, which is a guarantee against spurious imitation.

J. W. Stratton & Co.

"DIRECTIONS.—Put two teaspoonfuls of this cocoa into a teacup; pour a few spoonfuls of cold milk; beat into a stiff paste; then fill the cup with boiling milk, or milk-and-water."

Analysis. —100 parts contain about 35 parts of a mixture of *potato-flour*, *Maranta arrow-root*, with a few grains of *sago-meal*.

We have heard of late a good deal about homœopathy and homœopathists, and are acquainted with some of the delusions and deceptions of the so-called system. We have heard, too, of homœopathic coffee, arrow-root, cocoa, &c.; but we are at a loss to comprehend what can be the nature of "homœopathic steam mills."

SOLUBLE COCOA.

16th *Sample.* — Purchased of R. A. Hollis, 78. Judd-street. Price 2*d.* per quarter-pound package.

"Soluble
COCOA,
Manufactured
By D. DUNN,
Pentonville, London."

Analysis. — 100 parts consist of about 18 parts *sugar*, and the remaining 82 parts of a combination of cocoa and starch, in the proportion of about 25 of the latter to 100 of the former, the starch being a mixture of *Maranta arrow-root*, *tapioca-starch*, *Indian-corn meal*, *potato-flour*, with a few granules of *Curcuma arrow-root*.

17th *Sample.* — Purchased of Henry Thorpe, 30. Chapel-street, Edgware-road. Price 2*d.* per quarter-pound packet, of a hexagonal form.

"BEST SOLUBLE COCOA,
TYLER & ESSEX,
LONDON."

Analysis. — 100 parts consist of about 11 parts *sugar*, and the remaining 89 parts of a combination of cocoa and *potato-flour*, the latter in the proportion of about 50 parts to 100 of the former.

18*th Sample.* — Purchased of Bodley & Co., 5. Portman-place, Edgware-road.

"STRATTON'S
IMPROVED
SOLUBLE COCOA,
WHICH REQUIRES NO BOILING.
A DELICIOUS PREPARATION OF THE
Genuine Cocoa-nut.
Prepared only by the Sole Inventors,
J. W. STRATTON & CO.

"To obtain this pure preparation of the genuine cocoa-nut, as invented by us, the sole manufacturers, it is requisite to see that our name is on the envelope, as some unprincipled firms have condescended to the meanness of imitating our labels."

Analysis. — 100 parts consist of about 13 parts *sugar*, and the remaining 87 parts of a combination of cocoa and starch, in the proportion of about 45 of the latter to 100 of the former, the starch being a mixture of *potato-flour* and a little *sago-meal*.

19*th Sample.* — Purchased of Waller & Co., 80. Charlotte-street, Tottenham-court-road. Price 1½*d.* per quarter-pound packet.

"Genuine Soluble
COCOA.
GRAHAM & HEDLEY,
Manufacturers,
Liverpool.

Use equal to coffee, beat into a paste, then add
boiling water."

Analysis. — 100 parts consist of about 14 parts *sugar*, and the remaining 86 parts of a combination of cocoa and *sago-meal*, the latter in the proportion of about 24 parts to 100 of the former.

20*th Sample.* — Purchased of W. J. Martin, 147. Edgware-road. Price 2*d.* per quarter-pound packet.

"BARON
DUPUYTREN'S
CELEBRATED
SOLUBLE COCOA."

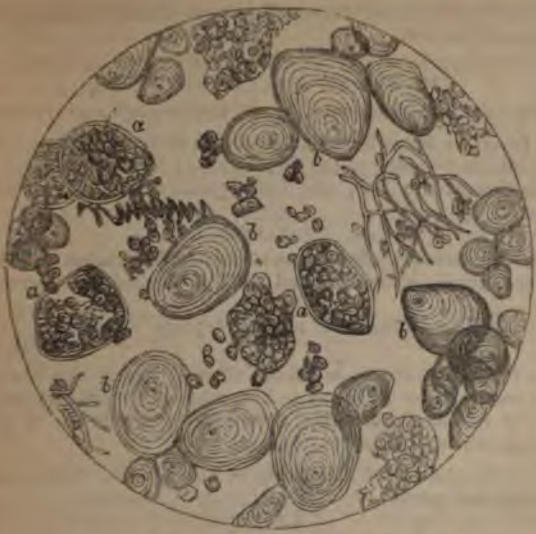
Analysis. — 100 parts consist of about 20 parts *sugar*, and the remaining 80 parts of a combination of cocoa and *potato-flour*, the latter in the proportion of about 55 parts to 100 of the former.

21*st Sample.* — Purchased of J. H. Kemper, 1. Waterloo-terrace, Commercial-road East. In quarter-pound hexagonal packet. Price 2*d.*

"STEANE, DAVIS, AND CO.'S
Superior
SOLUBLE COCOA,
MADE IN ONE MINUTE WITHOUT BOILING.
MANUFACTORY,
OXFORD."

Analysis. — 100 parts consist of about 15 parts *sugar*, and the remaining 85 parts of a combination of cocoa and *potato-flour*, the latter in the proportion of about 40 parts to 100 of the former.

Fig. 80.



STEANE, DAVIS, & CO.'S SUPERIOR SOLUBLE COCOA.
a a a, starch-corpuscles, cells, and spiral vessels of cocoa;
b b b, granules of *potato-flour*.

2nd Sample. — Purchased of E. Bynner, 35. Newport-street, Soho Price 1½*d.* the quarter-pound packet.

"TAYLOR BROTHERS'
SOLUBLE
COCOA."

Analysis. — 100 parts consist of about 14 parts *sugar*, and the remaining 86 parts of a combination of cocoa and starch, in the proportion of about 32 of the latter to 100 of the former, the starch being a mixture of *potato and wheat flours.*

3rd Sample. — Purchased of Hawthorn & Co., 38. Tottenham-court-road. Price 1½*d.* per quarter-pound packet.

"The Celebrated
SOLUBLE COCOA,
HAWTHORN & Co.,
Manufacturers."

Analysis. — 100 parts consist of about 26 parts *sugar*, and the remaining 74 parts of a combination of cocoa and *sago-meal*, the latter in the proportion of about 22 parts to 100 of the former.

4th Sample. — Purchased of Hawthorn & Co., 38. Tottenham-court-road. Price 2*d.* per quarter-pound packet.

"Superior Soluble
COCOA,
Manufactured by
BARRY & Co.,
London."

Analysis. — 100 parts consist of about 20 parts *sugar*, and the remaining 80 parts of a combination of cocoa and *sago-meal*, the latter in the proportion of about 16 parts to 100 of the former.

Homœopathic Cocoa.

25th Sample.— Purchased of Henry Sparrow, Oxford-street. Price 4*d.* quarter-pound packet.

"SPARROW'S
IMPROVED DIETETIC COCOA,
Especially recommended by the Homœopathic profession.

"Prepared from the finest Trinidad nuts, on an improved principle, whe the fine bland oil (so peculiar to the finest cocoa) is incorporated with the naceous properties of the nut, and consequently will agree with the delicate stomach.

Invalids

and others who are recommended cocoa should be particular what kind the as cocoa prepared from old or damaged nuts is *rancid* and therefore *decid* *unwholesome.*

None Genuine unless signed thus,—

H. Sparrow.

Analysis.— 100 parts consist of about 16 parts *sugar*, and the remaining parts of a combination of cocoa and starch, in the proportion of 20 of latter to 100 of the former, the starch being a mixture of *tapioca-st* and a few granules of *Maranta arrow-root.*

26th Sample.— Purchased of J. Leath, 9. Vere-street, Oxford-street. P 1*s.* 4*d.* per pound packet.

"Leath's
Dietetic or Homœopathic
COCOA.

"Three things have been sought in the preparation of this article of diet:

"Pleasantness of flavour, nutritiveness, and facility of digestion. It is c pounded from the best samples of the Theobroma Cocoa, therefore most e cially adapted for dyspeptic persons, and also for those who from other ca are compelled to resort to medical treatment, whilst it is an equally deli and economical article for the daily consumption of every one.

"All that is nutritive in the useful product from which this cocoa is prep has been carefully preserved, whilst all that is obnoxious has been as caref rejected.

British Homœopathic Pharmacy,
9. Vere-street, Oxford-street."

Analysis.— 100 parts consist of about 16 parts *sugar*, and the remaining parts of a combination of cocoa and starch, in the proportion of about 2 the latter to 100 of the former, the starch being a mixture of *Mar* *arrow-root, sago-meal, and potato-flour.*

27th Sample.— Purchased of W. Headland, 15. Princes-street, Hanover-squ Price 1*s.* 6*d.* per pound packet.

"The Homœopathic or Dietetic
COCOA,

Is a preparation containing all the nutritious properties of the Nut, *without* *objectionable admixture.*

Prepared by W. Headland, *Homœopathic Chemist.*"

Analysis.— 100 parts consist of about 14 parts *sugar*, and the remaining parts of a combination of cocoa and starch, in the proportion of abou of the latter to 100 of the former, the starch being a mixture of *tapi* *Curcuma arrow-root, potato-flour, with a little Maranta arrow-root.*

28th Sample.— Purchased of T. Halstead, 17. Norton Folgate. Price 4½*d.* quarter-pound packet.

"Cadbury Brothers'
(Birmingham)
HOMŒOPATHIC COCOA."

Analysis. — 100 parts consist of about 24 parts *sugar*, and the remaining 76 parts of a combination of cocoa and *wheat-flour*, in the proportion of about 16 of the latter to 100 of the former.

th Sample. — Purchased of Wm. Tulloch, 171. Shoreditch. Price 8*d.* per half-pound canister.

"GRAHAM & HEDLEY'S
Superior Homœopathic Cocoa.

"This exquisite preparation, made from the recipes of the most able Homœo-
THISTS, combines in an eminent degree all the aromatic and nutritious pro-
rties of the Cocoa-nut, the disagreeable oily matter being separated by a new
d peculiar process, by which it is rendered more highly nutritious. It may
taken with advantage by the most delicate, being light and easy of digestion.
Liverpool."

Analysis. — 100 parts consist of about 20 parts *sugar*, the remaining 80 parts being nearly all cocoa, with a very small per-centage of *sago-meal.*

h Sample. — Purchased of G. & W. Law, 1. New Oxford-street. Price 1*s.* 4*d.* per half-pound packet.

"HOMŒOPATHIC COCOA,
made by
J. S. Fry & Sons, Bristol."

Analysis. — 100 parts consist of about 20 parts *sugar*, and the remaining 80 parts of a combination of cocoa and starch, in the proportion of about 20 of the latter to 100 of the former, the starch being a mixture of *Maranta arrow-root, sago-meal, and Canna arrow-root, or Tous les Mois.*

t Sample. — Purchased of T. Christie, 9. Whitechapel. Price 4*d.* per quarter-pound packet.

"PREPARED HOMŒOPATHIC COCOA
rticularly adapted for Persons of weak Digestive Powers, & Invalids generally.
Prepared only at Steane, Davis & Co.'s
Mustard & Cocoa Steam Mills, Oxford."

Analysis. — 100 parts consist of about 26 parts *sugar*, and the remaining 74 parts of a combination of cocoa and starch, in the proportion of about 16 of the latter to 100 of the former, the starch being a mixture of *Maranta arrow-root and potato-flour.*

d Sample. — Purchased of Nicol & Co., 15. Rathbone-place. Price 4½*d.* per quarter-pound packet.

"NICOL & CO.
Manufacturers of Homœopathic Cocoa
by Special Appointment.

"This is the most pure and genuine cocoa, and far surpasses in quality any
de, and is most extensively used and recommended by all medical men, as a
t nutritious and pleasant beverage, at 1*s.* 6*d.* per pound.
15. Rathbone-place."

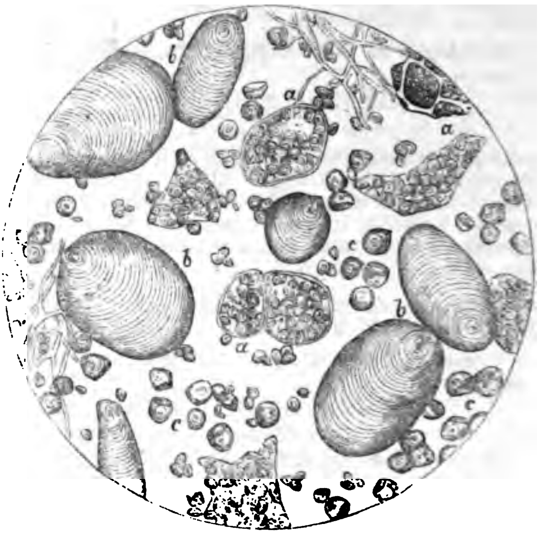
Analysis. — 100 parts consist of about 10 parts *sugar*, and the remaining 90 parts of a combination of cocoa and wheat-flour, in the proportion of nearly 10 of the latter to 100 of the former.

d Sample. — Purchased of Edwin Frost, 288. Oxford-street. Price 4*d.* per quarter-pound packet.

"TAYLOR BROTHERS'
HOMŒOPATHIC COCOA.

repared under the most able Homœopathic advice; and combining the
ess, fine aroma, and nutritious property of the Fresh nut.
ocoa is the best of all flavoured drinks; it is highly nutritious; it may be
with benefit by the most delicate or consumptive constitutions.
(*See* Domestic Homœopathy, by John Epps, M. D.)

Fig. 81.



Taylor Brothers' Homœopathic Cocoa.
a a a, granules and cells of cocoa; *b b b*, granules of *Canna-starch* or *Tous les Mois*; *c*, granules of *tapioca-starch*.

Taylor Brothers

Confidently challenge a comparison between this and all or any of the s
Homœopathic Cocoas. One trial will suffice, and add to the presen
consumption of their article."

Analysis. — 100 parts consist of about 20 parts *sugar*, and the remai
parts of a combination of cocoa and starch, in the proportion of abo
the latter to 100 of the former, the starch being a mixture of *tapioca*
and Canna arrow-root, or Tous les Mois.

34th Sample. — Purchased of J. Hale, 53. Brewer-street, Golden-square.
9*d.* the half-pound packet.

"EPPS' PREPARED COCOA."

Analysis. — 100 parts consist of about 13 parts *sugar*, and the remai
parts of a combination of cocoa and starch, in the proportion of abo
the latter to 100 of the former, the starch being a mixture of *A*
arrow-root, sago-meal, and potato-flour.

35th Sample. — Purchased of E. Frost, 288. Oxford-street. Price 8*d.* p
pound packet.

"BARRY AND COMPANY'S
HOMŒOPATHIC
COCOA,
London.
Strongly recommended to invalids, as being wholesome, nutritious, an
of digestion."

Analysis. — 100 parts consist of about 25 parts *sugar*, and the remai
parts of a combination of cocoa and starch, in the proportion of abo
the latter to 100 of the former, the starch being a mixture of *A*
arrow-root, with a little potato-flour and sago-meal.

That professed homœopathists should puff themselves and the articl
vend, by making general use of the word "homœopathic," is not sur
It is, however, to be regretted, that respectable dealers and manufa
should, by adopting a similar practice, give indirect countenance to so
delusion as homœopathy.

th Sample. — Purchased of W. Holland, 127. Oxford-street. Price 9*d.* per half-pound packet.

"RELFE'S
PECULIARLY PREPARED HOMŒOPATHIC
COCOA.

rongly recommended by the most eminent of the faculty, for persons of licate constitutions, as being very nutritious and easy of digestion.

Prepared and Sold by
J. H. Browing.
John Relfe, 4. Gracechurch-street, London."

Analysis. — 100 parts consist of about 12 parts *sugar*, and the remaining 88 parts of a combination of cocoa and starch, in the proportion of about 24 of the latter to 100 of the former, the starch being a mixture of *Tacca* or *Tahiti*, with a little *Maranta arrow-root.*

7th Sample. — Purchased of James Way & Co. 272. Oxford-street. Price 4*d.* per ¼ lb.

"TAYLOR BROTHERS'
DIETETIC COCOA,
London,
Adapted for Homœopathic Patients and Dyspeptics."

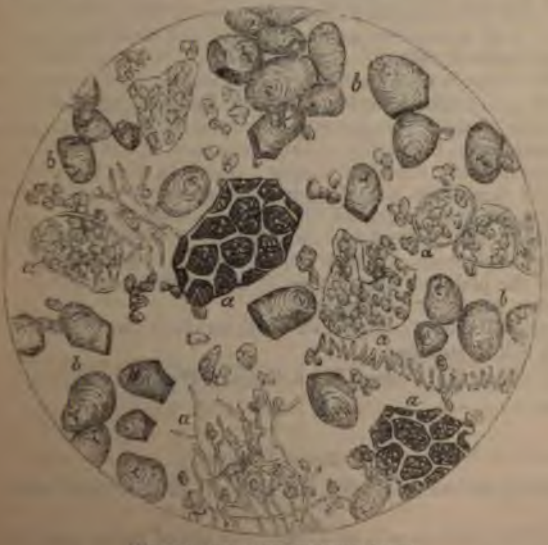
Analysis. — 100 parts consist of about 18 parts *sugar*, and the remaining 82 parts of a combination of cocoa and *starch*, in the proportion of about 26 of the latter to 100 of the former, the starch being a mixture of *Maranta arrow-root* and *potato-flour.*

8th Sample. — Purchased of G. B. White, 147. Shoreditch. Price 3*d.* per ¼ lb. packet.

"WHITE'S
PURE
HOMŒOPATHIC
COCOA."

Analysis. — 100 parts consist of about 8 parts *sugar*, and the remaining 92 parts cocoa, with a small proportion of *sago-meal.*

Fig. 82.



White's Pure Homœopathic Cocoa.
a a a, starch-granules, cells, and fragment of cocoa;
b b b, granules of *sago-meal.*

ROLL COCOA.

39th Sample.—Purchased of Owen Sparrow, 1. Aldgate. Price 2½*d.* a roll.

"GRAHAM & HEDLEY'S ROLL COCOA.

"COCOA has never been used in this country to any extent, owing to the dif culty of preparing it for the table, when purchased in the *raw* state, and to th almost impossibility of procuring it genuine when manufactured.

"GRAHAM & HEDLEY have in consequence been induced by some of the mo extensive growers, to undertake its manufacture, in order to bring this mo wholesome and nutritious beverage more into consumption with the industrio millions, and they now offer it to the public prepared in a PERFECTLY PU STATE, and in a new and more convenient form for use, being moulded into rol *or sticks*, each piece of which is stamped

'GRAHAM & HEDLEY'S ROLL COCOA, *Warranted Genuine.*'

"This is strongly recommended as being the best preparation of cocoa ev offered to the public, as well as the most economical substance that can be us for morning and evening meals. To invalids (to whom it is essential to h the article genuine), the advantages of using this must be apparent. A quar of a pound will go as far as a pound of that usually sold in *red* packages."

Genuine.

40th Sample.—Purchased of E. Bristow, 2. Newcastle-place, Edgware ro Price 3*d.* per roll.

"GENUINE ROLL COCOA,
Made by
TAYLOR BROTHERS,
The Most Extensive Manufacturers of Cocoa in Europe, Inventors and S Proprietors of the Original Soluble and Dietetic Cocoas.

(A designation so unwarrantably adopted by certain provincial makers.)

"*This* Roll Cocoa is not put forth on the strength of *professors' certific* which, it is well known, can be obtained at any time for a few pounds, and whi as regards Roll Cocoa, really signify nothing; for supposing that all they m be correct in reference to the *particular roll or sample under test*, it is obvi that such can be *no guarantee for the quality of what is produced afterward*

"The *test* which TAYLOR BROTHERS submit to with confidence is the test *public taste*, and the *testimonial* they rely upon is that of their *established re tation*, as the *first manufacturers* in Europe; and their *guarantee for quali* the *name* they have at stake.

"The Roll Cocoa is *warranted perfectly genuine*, and is only another for presenting to the public 'Taylor Brothers' Refined Cocoa Nibs,' which are choicest kernels of the finest growths, the form of roll being more conveni but adding nothing to the purity of the cocoa, and is *not a patent right*, as so makers pretend, being the most simple process in the manufacturing *a pl chocolate;* the DIETETIC AND HOMŒOPATHIC require much greater art nicety, and are far better adapted for the purposes intended. All Roll Coco simply the nibs merely ground and moulded into that form, and as such, requ no testimonial at all from *professors of chemistry*, especially not such nonse cal jargon as the plainest common sense cannot fail to detect in one or more the testimonials set forth respecting it.

"Purchasers will please compare this with any Roll Cocoa before the public, a see that each roll is stamped

TAYLOR BROTHERS' ROLL COCOA, *Warranted Genuine.*"

Genuine.

ROCK COCOAS.

41st Sample.—Purchased of R. H. Feltoe, 298. Oxford-street. Price per lb.

Analysis.—100 parts consist of a combination of cocoa and starch, the l being in the proportion of about 18 parts to 100 of the former, the st being a mixture of *potato-flour* and *sago-meal.*

42nd Sample.—Purchased of Houle & Company, 282. Oxford-street. Price 10*d.* per pound.

Analysis.—100 parts consist of a combination of cocoa and starch, the latter being in the proportion of about 18 parts to 100 of the former, the starch being a mixture of *potato-flour* and *sago-meal.*

43rd Sample.—Purchased of Holland & Company, 78. Lambs' Conduit-street. Copy of placard:—

"Genuine Rock Cocoa,
ground from the pure nut.
Price
One shilling per lb."

Analysis.—100 parts consist of a mixture of cocoa and *wheat-flour*, in the proportion of about 35 of the latter to 100 of the former.

44th Sample.—Purchased of James Appleton, 174. Drury-lane. 10*d.* per pound.

Genuine.

45th Sample. — Purchased of G. B. White, 174. Shoreditch. Price 1*s.* per pound.

Analysis.—100 parts consist of about 8 parts *sugar*, and the remaining 92 parts of cocoa, with a small proportion of *sago-meal.*

46th Sample.—Purchased of William Oakley, 72. High-street, Whitechapel.

"Strongly recommended and very rarely obtained.
Pure Cocoa.
10*d.* a pound.

"This article, being invaluable to invalids for its nutritious properties, is made on the premises."

Genuine.

47th Sample. — Purchased of Rogers & Company, 97. Crawford-street, Edgware-road. Price 1*s.* per pound.

Analysis.—100 parts consist of a mixture of cocoa and *wheat-flour*, the latter in the proportion of about 45 per cent.

48th Sample.—Purchased of H. Williams, 92. Crawford-street, Bryanston-square. Price 1*s.* per pound.

Analysis.—100 parts consist of a mixture of cocoa and *wheat-flour*, the latter in the proportion of about 35 per cent.

49th Sample.—Purchased of A. Andrews & Co., 57. Tottenham-court-road. Price 10*d.* per pound.

Analysis.—100 parts consist of a mixture of cocoa and *wheat-flour*, the latter in the proportion of about 35 per cent.

Soluble Cocoas.

50th Sample.—Purchased of M. Jones & Co., 166. Oxford-street. In hexagon tin-foil package, price 2*d.*

"FRY & SONS'
CELEBRATED
SOLUBLE COCOA."

Analysis.—100 parts consist of about 8 parts *sugar*, and the remaining 92 parts of a combination of cocoa and starch, the latter in the proportion of about 26 parts to 100 of the former, the starch being a mixture of *sago-meal* and *potato-flour.*

51st Sample.—Purchased of E. Frost, 288. Oxford-street. In hexagon tin-foil package, price 2*d.*

"TAYLOR BROTHERS'
CELEBRATED
SOLUBLE COCOA."

Analysis.— 100 parts consist of about 14 parts *sugar*, and the remaining 86 parts of a combination of cocoa and starch, the latter in the proportio about 42 parts to 100 of the former, the starch being a mixture of *po* with some *wheat flour.*

52nd Sample.—Purchased of G. W. Back, Whitechapel. Price 2*d.* per pac

"BARON DUPUYTREN'S
EXHIBITION COCOA
FOR 1851
Entered at Stationers' Hall, according to Act of
Parliament."

Analysis.—100 parts consist of about 16 parts *sugar*, and the remaining parts of a combination of cocoa and *wheat-flour*, the latter in the pro tion of about 40 parts to 100 of the former.

53rd Sample.—Purchased of W. Lodge, 47. Great James-street, Lisson-gr Price 1*d.*

"BEST
SOLUBLE COCOA,
Per ONE PENNY Packet.
TYLER & ESSEX."

Analysis.—100 parts consist of about 12 parts *sugar*, and the remaining parts of a combination of cocoa and *wheat-flour*, the latter in the propor of about 65 parts to 100 of the former.

54th Sample.—Purchased of G. Clark, 135. Tottenham-court-road. Price per quarter-pound packet.

"SOLUBLE
COCOA,
Manufactured by
J. S. FRY & SONS."

Analysis.—100 parts consist of about 8 parts *sugar*, and the remaining parts of a combination of cocoa and starch, the latter in the proportio about 30 parts to 100 of the former; the starch being a mixture of *pot flour* and *sago-meal.*

55th Sample.—Purchased of W. Holland, 127. Oxford-street. Price in a 1*s.* 6*d.*

"FRY'S
BEST CHOCOLATE
or
COCOA PASTE,
Made by J. S. Fry & Sons.

Analysis.—100 parts consist of a mixture of cocoa, sugar, *potato-flour*, *sago-meal*, made into a stiff paste with *water*; the sugar and water f about 50 parts in 100 of the article, the remainder consisting of cocoa a small proportion of *potato-flour* and *sago-meal.*

56th Sample.—Purchased of W. J. Staniforth, 138. Oxford-street. Price i jar, 1*s.*

"DUNN'S COCOA PASTE."

Analysis.—100 parts consist of a mixture of cocoa and *sugar*, made int stiff paste with *water*; the sugar and water form about 58 parts in 10 the article.

From the above analyses it appears—

1st. That *Eight* of the Fifty-six samples submitted to examination *genuine.* The following are the articles, with the names, either of the dea from whom they were obtained, or the parties by whom they were man tured.

Kemper's Flaked Cocoa—Purchased of J. H. Kemper, 1. Waterloo-ter Commercial-road East.

Ridgway's Flaked Cocoa—Purchased of Messrs. Ridgway & Co., 4 & 5 K William-street, City.

Flaked Cocoa—Purchased of J. Lawrence, 51. High-street, Bloomsbury.

Handford and Davies' Granulated Cocoa—Purchased of Handford & Davies, 61. High Holborn.

Graham and Hedley's Roll Cocoa—Manufactured by Graham & Hedley, Liverpool.

Taylor Brothers' Roll Cocoa—Manufactured by Taylor Brothers, Brick-lane, Spitalfields.

Rock Cocoa—Purchased of J. Appleton, 174. Drury-lane.

Oakley's Rock Cocoa—Purchased of W. Oakley, 72. High-street, Whitechapel.

2nd. That *sugar* was present in *Forty-three* samples, the amount forming from five to in some cases as much as nearly fifty per cent. of the article.

3rd. That *starch* was detected in *Forty-six* of the samples, the quantity present varying from five to nearly fifty per cent., and consisting either of *wheat*, *potato-flour*, *sago-meal*, &c., or mixtures of these in various proportions.

(Since the above analyses were made, we have more than once met with samples of cocoa nibs adulterated with chicory: this is a frequent adulteration of cocoa in the state of nibs.)

It is curious to notice the kinds of fecula, and the combinations of these employed by some makers.

Thus Nicoll & Co., Cadbury Brothers, Gatti and Bolla, &c., make use of *wheat-flour*.

Steane, Davis, & Co., appear to give preference to *potato-flour*.

White employs *sago-meal*, which is met with in all his preparations of cocoa and chocolate.

Taylor Brothers, use chiefly a mixture of *potato and wheat flours*.

Fry & Sons prefer a mixture of *potato-flour* and *sago-meal*, a combination which occurs, as will be seen by reference to the analyses, in nearly all the articles bearing their names.

Dunn's cocoas all contain a mixture of *tapioca-starch*, *Maranta arrow-root*, *sago meal*, *Indian corn-flour* and *Curcuma arrow-root*.

The object of employing a mixture of several kinds of starch in the same preparation is by no means clear. It is perhaps explained by the fact that dock and warehouse sweepings, which consist of a mixture of various starches, are in some cases used by the manufacturers of cocoa.

We will now consider the purposes served by the admixture of starch and sugar with cocoa.

The coffee dealer assures us that chicory is a great improvement to coffee; the manufacturer of mustard that that substance cannot be eaten unless admixed with plenty of wheat-flour and turmeric powder; while the cocoa-maker asserts that starch is a great improvement to cocoa; that it renders it "soluble," forms an "emulsion" with it, and causes it to be more "digestible."

It is certain that starch does not exert the slightest solvent action on cocoa, and therefore this alleged advantage has no existence. Cocoa, as appears from the analyses previously given, contains a considerable quantity of nitrogenized matter, starch, and oil; when boiled in water, the oil is dissolved out, and the starch granules swell up and become broken. When starch foreign to cocoa is added, the same occurs, the additional starch undergoing a similar change, causing the decoction to become thick and gelatinized, thus imparting to it a greater *appearance* of body and strength. If the quantity of starch added be considerable, a portion of the oil of the cocoa, in place of rising to the surface, will remain diffused throughout the liquid, the globules of oil being held in suspension by means of the starch by which the whole fluid is thickened. The assertion that starch makes cocoa more "digestible" has no more foundation than that it renders it "soluble." When a decoction of cocoa and starch is partaken of, the starch has to be digested in addition to the cocoa. If it were asserted that some forms of starch are more digestible than cocoa, and that a beverage in which the two are combined is more digestible than one made from pure cocoa, there would be some show of reason for the assertion. In the case of the admixture of starch and sugar with cocoa, it should be distinctly borne in mind, however, that for every additional per-centage of these substances added, there is so much less of cocoa, with its oily and nitrogenized constituents.

As nature has provided the cocoa-bean with eleven per cent. of starch, we are the more disposed to question the accuracy of the position assumed by cocoa manufacturers that the addition of wheat, potato, and sago-flours, constitutes any real improvement. What nature does is doubtless done well and sufficiently, and we believe that the quantity of starch proper for cocoa is to be found in the kernels themselves.

The real secret of the almost constant use of starch and sugar is to be found in the cheapness of these articles, and not in any advantages supposed to be derived from their admixture with cocoa; this we shall now proceed to show.

Genuine cocoa, in the form of flake, rock, or roll, is sold at from 10*d.* to 1*s.* per pound; wheat-flour may be purchased at 1½*d.*, potato-flour and sago-meal at about 3*d.* or 4*d.* per pound; sugar at from 3*d.* to 5*d.* per pound. The mixtures of cocoa, starch, and sugar, are sold at from 6*d* to 2*s.* 8*d.* per pound; let the reader compare these prices with the cost of wheat and potato flours, and he will then perceive what a field for imposition and extortion the admixture of these substances with cocoa affords.

The present wholesale price of raw cocoa varies from 25*s.* to 47*s.* per cwt., being about 3*d.* to 4½*d.* per pound. The manufacturer will tell us that for the sugar and starch added to the cocoa, he makes a corresponding reduction in the cost of the compounded article; this, however, is not in general the case, as will appear by a comparison of the prices with the composition of the samples analysed.

Setting aside, however, the question of price, and whether the admixture of starch with cocoa is attended with any advantages or not, on the same principle as we objected to the calling of the mixture of chicory and coffee—coffee, we also object to designating a compound of starch, sugar, and cocoa by the name of the latter only, no adjective being prefixed to the word cocoa, indicating the presence in the article of any other substances.

Cocoa is subjected to a small duty, and, like other excisable articles, its adulteration is in violation of the law. The duty is 1*d.* per pound, from whatever quarter imported; ½*d.* per pound on *husks and shells;* 2*d.* per pound on cocoa or chocolate *paste.*

The quantity entered for home consumption was, in 1852, 3,385,632 lbs.; in 1853, 4,126,687 lbs.; and in the first six months of 1854, 2,432,939 lbs.

"By 43 Geo. III. c. 129. s. 5. IT IS ENACTED—That if any burnt, scorched, or roasted peas, beans, or other grain or vegetable substance or substances prepared or manufactured for the purpose of being in imitation of, or in any respect to resemble coffee or cocoa, or to serve as a substitute for coffee or cocoa, or alleged, or pretended by the possessor or vendor thereof so to be, shall be made or kept for sale, or shall be offered or exposed to sale, or shall be found in the custody or possession of any dealer or dealers in, or seller or sellers of coffee or cocoa, or if any burnt, scorched, or roasted peas, beans, or other grain or vegetable substance or substances, not being coffee or cocoa, shall be called by the preparer, manufacturer, possessor, or vendor thereof, by the name of English or British coffee, or any other name of coffee, or by the name of American cocoa, or English or British cocoa, or any other name of cocoa, the same respectively shall be forfeited, together with the packages containing the same, and shall and may be seized by any officer or officers of excise, and the person or persons preparing, manufacturing, or selling the same, or having the same in his, her, or their custody or possession, or the dealer or dealers in or seller or sellers of coffee or cocoa, in whose custody the same shall be found, shall forfeit and lose the sum of One Hundred Pounds. See also 11 George I. c. 30. s. 9., &c."

The provisions of the 43rd of George III. c. 129., quoted by us above, have, however, been so far modified by the enactments of the 3rd of George IV. c. 53. as to render it *perfectly legal* for persons who are "duly licenced to deal in cocoa," and whose premises are properly "entered at the nearest excise office," and who shall—

"Not be scorchers or roasters of corn, peas, beans, or parsnips, or who have not in their possession such corn, peas, beans, or parsnips, to make and manufacture in such entered premises, and with the knowledge of the proper officer, Cocoa-paste, broma, and other mixtures and preparations of cocoa with *sugar and arrowroot-flour* or *other farinaceous powder*, such arrowroot-flour or other

ous powder not being baked, scorched, roasted, or otherwise disguised
d from its natural state, except by being mixed with cocoa as aforesaid,
sell and offer and expose to sale such cocoa-paste, broma, or other
or preparation as aforesaid."

far, then, and under these provisions, an admixture of "sugar and
ot-flour, or other farinaceous powder," with *cocoa*, is strictly legal; but
ime enactment it is provided, that

ly person or persons shall make or manufacture any cocoa-paste, broma,
mixture or preparation of cocoa as aforesaid, without first making such
aforesaid, or shall mix with any cocoa any *baked, scorched, or roasted*
whatsoever, or *any ingredient whatsoever, except as aforesaid*," &c. &c.,
s, "sugar and arrowroot-flour, or other farinaceous powder,"—every
son and persons, "in such cases respectively offending, shall for every
nce severally forfeit and lose the sum of *one hundred pounds*."

eady remarked, the substances employed to mix with and adulterate
e various forms of starch, different qualities of sugar, chicory, animal
earthy and other colouring matters. Except these, but few, if any
ostances are employed, or have ever been *detected*.

above enactment, therefore, is to accomplish the purposes for which it
expressly framed, it clearly ought to apply to those substances which
nonly and notoriously employed in the adulteration of cocoa, such as
those we have mentioned; if it do not do that, then is it a complete
s regards cocoa and its adulterations.

CHOCOLATE AND ITS ADULTERATIONS.

cocoa, chocolate is, as is well known, a manufactured article; the
articularly excel in its preparation, making a variety of combinations
with other substances.

ore common additions are, however, sugar, and various kinds of starch.
tter descriptions of chocolate, Maranta arrow-root is employed.
parting flavour and scent, vanilla and cinnamon are chiefly used.
onally a medicinal chocolate is prepared with salep, a fecula obtained
bulbous root of an orchis. In some cases, also, chocolate is made the
or the administration of various remedies, the taste of which is to a
ent concealed by the chocolate.

ature of the substances of which any chocolate consists may, in most
very satisfactorily determined by the microscope, by which the struc-
onging to each particular substance may be recognised.

oints requiring particular attention in the manufacture of chocolate are
n the selection and roasting of the kernels; the winnowing of the husk;
ful reduction of the kernels to a smooth and uniform paste; and the
of this into cakes, in moulds so smooth as to impart a polished surface
kes.

chocolates manufactured by M. Lebaigue, these points have been all
nded to, and the superiority of these articles in flavour, smell, and
ce, over those usually met with in the shops, is very obvious.

w subjoin analyses of a few of the chocolates in the forms of powder
e, more commonly met with, and the composition of which it may
sting to some to be made acquainted with.

Chocolate Powder.

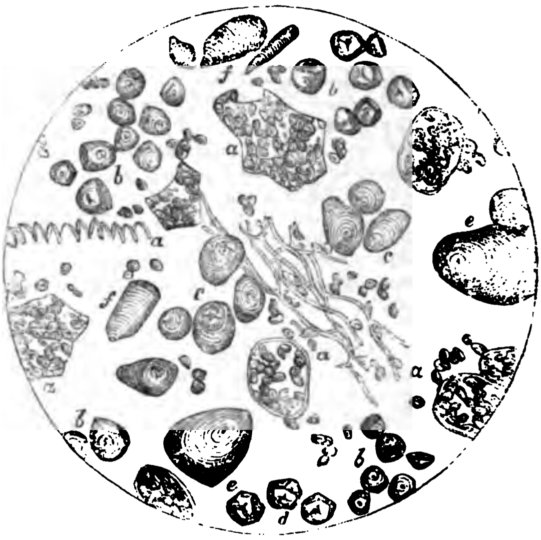
le.—Purchased of Bodley & Co., 5. Portman-place, Edgware-road.

Placard.

"Genuine Unadulterated
CHOCOLATE POWDER,
By J. Dunn and Co.
1*s.* 2*d.* per pound."

is.— 100 parts consist of about 13 parts *sugar*, and the remaining 87
of a combination of cocoa and starch, the latter in the proportion

Fig. 83.



Dunn's Genuine Unadulterated Chocolate Powder.
a a a, starch-granules and cells of cocoa; *b b b*, granules of *tapioca-starch*; *c c c*, *Maranta arrow-root*; *d*, *Indian corn meal*; *e e*, *potato-starch*; *f f*, *Curcuma arrow-root*.

about 25 parts to 100 of the former; the starch being a mixture of *tap starch*, *Maranta arrow-root*, *Indian corn-flour*, and *sago-meal*.

2nd Sample. — Purchased of Gatti & Bolla, Holborn. Price *5d.* per qu pound pentagon packet.

"GATTI & BOLLA'S
GENUINE
FRENCH CHOCOLATE
POWDER."

Analysis. — 100 parts consist of about 35 parts *sugar*, and the remaini parts of a mixture of *cocoa* and *wheat-flour*, the latter in the proport about 30 parts to 100 of the former.

3rd Sample. — Purchased of G. B. White, 147. Shoreditch. Price 2 quarter-pound packet.

"WHITE'S
CHOCOLATE POWDER,
147. Shoreditch."

Analysis. — 100 parts consist of about 14 parts *sugar*, and the remaini parts of a mixture of cocoa and *sago-meal;* the latter in the proport about 10 parts to 100 of the former.

4th Sample. — Purchased of Staniforth, 138. Oxford-street. Price 4 packet.

"Unadulterated
CHOCOLATE POWDER,
Manufactured by
DANIEL DUNN.

"This article, although manufactured expressly for invalids, is th beverage for the healthy, as the indigestible oily substance existing in the nut, and in most of the other preparations from it, is ***neutralised*** in thi rendered highly nutritious."

Analysis. — 100 parts consist of about 14 parts *sugar*, and the remain parts of a combination of cocoa and starch, the latter in the propor about 16 parts to 100 of the former; the starch being a mixture of *tapioca, Maranta arrow-root, sago-meal, Curcuma arrow-root,* and *Indian corn flour.*

CHOCOLATE IN CAKE.

5th Sample. — Purchased of E. Bynner, 35. Newport-street, Soho; quarter-pound cake. Price 2*d.*

"SPANISH CHOCOLATE."

Analysis. — 100 parts consist of a mixture of cocoa and starch, the latter in the proportion of about 15 parts to 100 of the former; the starch consisting of *wheat*, with some *potato-flour.*

6th Sample. — Purchased of C. E. Back, 123. Tottenham-court-road. Price 4*d.* per cake.

"STRATTON'S PATENT COMPRESSED
TRINIDAD COCOA,

From which a cup of the most luxurious and aromatic flavoured cocoa can be produced in one minute, without the trouble of boiling.

EACH CAKE IS STAMPED WITH OUR NAME.

The Patent Compressed Trinidad Cocoa has hitherto been confined to the circles of the rich, and used only as a luxury; it is now reduced in price to meet the circumstances of most persons; it is recommended by eminent physicians as an elegant beverage for breakfast or supper, as it sits lighter on the stomach than animal or vegetable jellies; its mild and exquisite aromatic flavour renders it very pleasant to eat as a confection."

Analysis. — 100 parts consist of about 14 parts *sugar*, and the remaining 86 parts of a mixture of cocoa and *potato-flour*, the latter in the proportion of about 16 parts to 100 of the former.

7th Sample. — Purchased of G. B. White, 147. Shoreditch. Price 3½*d.* per cake.

"ROYAL NAVY CHOCOLATE."

Analysis. — 100 parts consist of a mixture of cocoa and *sago-meal*, in the proportion of about 14 of the latter to 100 of the former, with a very small quantity of sugar.

8th Sample. — Purchased of Abbiss & Co., 60. Gracechurch-street, City. Price 5*d.* per quarter-pound cake.

"CAPPER AND GRAY'S
SUPER-SOLUBLE
CHOCOLATE,
FOR INVALIDS, CONVALESCENTS,
AND
PERSONS OF WEAK DIGESTION.
Recommended by the Faculty.

Invaluable in the nursery, as a most nutritious article of diet for invalids."

Analysis. — 100 parts consist of a mixture of cocoa and *sugar*, made into a cake with *water*, the cocoa forming about 56 per cent. of the article.

9th Sample. — Purchased of A. Teetgen, 154. Whitechapel-road. 4*d.* per quarter-pound cake.

"PURIFIED SOLUBLE
CHOCOLATE,
which requires no boiling.
Warranted by
PEEK BROTHERS & Co."

alysis. — 100 parts consist of a mixture of cocoa and *sugar*, made into a ake with water, the cocoa forming about 53 per cent. of the article.

Sample. — Purchased of Hall & Co., Edgware-road. Price 3*d.* per arter-pound cake.

"TAYLOR BROTHERS' SOLUBLE CHOCOLATE
WHICH REQUIRES NO BOILING."

Analysis — 100 parts consist of a mixture of cocoa and *sugar*, made into a cake with water, the cocoa forming about 57 per cent. of the article.

11*th Sample.* — Purchased of J. Walton, 129. Bishopsgate-street Without. Price 3*d.* per cake.

"BARRY AND COMPANY'S SOLUBLE CHOCOLATE,
WHICH REQUIRES NO BOILING."

Analysis. — 100 parts consist of a mixture of cocoa and *sugar*, made into a cake with water, the cocoa forming about 58 per cent. of the article.

12*th Sample.* — Purchased of I. Way & Co., 272. Oxford-street. Price 3*d.* per cake.

"FRY AND SONS' SOLUBLE CHOCOLATE."

Analysis. — 100 parts consist of a mixture of cocoa, *sugar*, *potato-flour*, and *sago-meal*, made into a cake with *water;* the sugar and water form about 42 parts, the remaining 58 parts of the article consisting of cocoa, and a mixture of the potato-flour and sago-meal in the proportion of about 10 parts to 100 of cocoa.

To the presence of sugar and starch, then, in chocolate, no fair objection can be urged. The points to be considered are, the price of the article, and the proportions and quality of the ingredients of which it consists.

In the above analyses, our attention has been directed chiefly to the determination, approximately, of the percentages of starch and sugar present in the various samples of cocoa and chocolate examined, as well as to ascertain the kinds of starch employed. On an early occasion, we shall embody, in a distinct Report, the results of a further examination of the whole of the samples above referred to.

To the Editor of THE LANCET.

SIR, — Having had my attention called to last week's LANCET, in which my name appears most conspicuously, allow me to explain the reason of your finding a small portion of sugar and sago in my navy chocolate. Some few years since, when my attention was first engaged in the manufacture of cocoa and chocolate, I applied to Sir John Hill, the Commandant of the Victualling Yard at Deptford, for permission to view the works there, which he was kind enough to grant. In the course of my inspection, I observed that to about every seven pounds of cocoa, one and a half pound sugar was added. On my enquiring the reason, of the foreman, I was told that some short time ago Dr. Ure had been there making some experiments, by order of the Lords of the Admiralty, and the result was, that they found the chocolate keep much better with the proportion of sugar, and when made give greater satisfaction to the men; and the same proportion is still adhered to. I therefore thought I could not go on better data than the medical testimony of Dr. Ure, and the experience of the manager: therefore I had my machinery put up in a similar manner. This accounts for the sugar. Some time since, a friend suggested to me, that if I substituted half the quantity of fine sago-flour for the like quantity of sugar I should greatly improve the article. I did so, and consider that not only does it greatly improve it, but the public like it much better. You can at any time see the process at the dock-yard, which I think will repay you; and if you can suggest anything in the manufacture that will improve the quality, I will be one of the first to avail myself of it, if you will allow me.

I have now a small complaint to make: I do not think you have treated me hardly fair—you have only tried my common chocolates, and not my best; if you had tried my best plain chocolate, at 1*s.* 4*d.* per pound, the result, I *think, would* have been to place me in the proud position of having the word after my name. Allow me also to point out a slight error: you say bought at from 25*s.* to 47*s.* per cwt., which makes them cost from 3*d.* er pound; you have forgotten the duty, which is 2*d.*, or 18*s.* 8*d.* per foreign, and 1*d.*, or 9*s.* 4*d.* per cwt., on British possession; there is loss on roasting of from eight to ten per cent., also on the shells of ixteen per cent.

e you will excuse me in pointing out these slight errors, for I think you not wilfully mislead the public; and as far as your analysis of my goes, I certainly was very much surprised at the exact proportion in every article is given. And when I look at the difference in the price of colate powder, at 8*d.*, and the different proportions in comparison with ench chocolate powder, at 1*s.* 8*d.*, I certainly am very much surprised; m young, and, I suppose, inexperienced. I hope you will excuse this tter, and beg to remain, yours, &c.,

oreditch, June, 1851. G. B. WHITE, Chocolate Manufacturer.

ON ERVALENTA, REVALENTA, &c.

THEIR COMPOSITION.

WARTON'S ERVALENTA.

(*Copied from Handbill.*)

"WARTON'S ERVALENTA,
ENSURING
HEALTH WITHOUT MEDICINE,
TO INVALIDS AND CHILDREN.

isagreeable, nutritious, farinaceous food radically cures habitual constipa- ostiveness), indigestion, piles, and all diseases originating in a disordered f the bowels and digestive organs, which it speedily restores to their na- igour and action, *without the aid of medicine*, or any other artificial means. so recommended as a most suitable diet for children, aged persons, and s generally. The invaluable properties and extraordinary efficacy of this tly curative dietetic have been acknowledged by the first physicians and cal chemists of the day, in France, England, and other countries.

(*See Medical and Chemical Certificates, Testimonials, &c.*)

PRICES OF WARTON'S ERVALENTA.

lb. canister	2*s.* 9*d.*	5 lbs. canister	11*s.* 0*d.*
lbs. ditto	4*s.* 6*d.*	8 lbs. ditto	16*s.* 6*d.*
12 lbs. canister	22*s.*		

WARTON'S MELASSE.

eable syrup, to be taken with 'WARTON'S ERVALENTA,' and particularly recommended in obstinate cases of constipation.

PRICES OF WARTON'S MELASSE.

b. bottle	1*s.* 0*d.*	4 lbs. bottle	3*s.* 0*d.*
b. ditto	1*s.* 9*d.*	8 lbs. ditto	5*s.* 0*d.*

en the Melasse is to be sent by a public conveyance, it is necessary to add *s.* for the packing-case, according to the size of the bottle ordered. The -case is necessary to prevent accidents on the road.

WARTON'S ERVALENTA BISCUITS.

. canister	2*s.* 9*d.*	3 lbs. canister	7*s.* 0*d.*
5 lbs. canister	10*s.* 0*d.*		

WARTON AND CO., 68, RUE RICHELIEU, PARIS.
LONDON DEPOT:
9, ST. MARTIN'S PLACE, TRAFALGAR SQUARE.

INSTRUCTIONS FOR PREPARING 'WARTON'S ERVALENTA.'

"The Ervalenta may be prepared with water, milk, milk-and-water, beef-tea, veal or mutton broth. The ordinary quantity for each meal is two ounces of Ervalenta to a pint of liquid. Mix the Ervalenta with a few spoonfuls of liquid, cold, until the powder is entirely diluted, then pour in by degrees the rest of the liquid; when the whole is well mixed, put it on the fire, and let it boil gently for ten minutes, stirring it continually with a spoon, that it may not burn. It should then be sweetened with 'WARTON'S MELASSE,' which is an auxiliary to the effect of the Ervalenta; or fresh butter, with sugar or salt, may be used.

"N.B.—'Warton's Ervalenta' and 'Melasse' ought to be carefully preserved from damp and heat. The Ervalenta, if kept in a dry place and occasionally stirred, will remain good for years.

IMPORTANT CAUTION.

"To avoid spurious imitations (often absolutely injurious) sold under similar names ('REVALENTA ARABICA,' 'EVERLENTA,' &c.) take notice that the canisters of 'WARTON'S ERVALENTA' bear the seal of WARTON, 68. Rue Richelieu, Paris (established 1841); they bear also the annexed signature. None others are genuine. *Warton.*

"N.B.—Persons having mistaken Lentil Flour for 'Warton's Ervalenta,' Warton & Co. inform the public that it is quite a different article.

IMPORTANT ADVICE.

"1. Persons suffering from constipation ought to take 'Warton's Ervalenta' and 'Melasse' regularly *twice* a day—for breakfast and supper.

"2. They should for some time avoid, as much as possible, the use of *wheaten bread*, and of all preparations of wheaten flour, puddings, pastry, &c.

"3. Rice, overboiled eggs, omelets, &c., are objectionable.

"4. Well cooked green vegetables, especially cabbages, stewed prunes, roasted or baked apples, and ripe fruits (except hard and dry fruits, as walnuts), are especially recommended.

"5. The meat eaten should be tender, and cooked in the simplest way; roasted meat is the most nutritious and digestible, and the best adapted for weak stomachs.

"6. Salt may be freely used, according to the taste, as it greatly assists digestion.

"7. Spirits should be avoided, also pepper and other spices, and acids.

"8. Wine should be taken moderately.

"9. Walking exercise in the open air ought to be taken every day if possible.

"10. It is highly necessary for health to keep the feet always warm.

"11. It is important to observe, that medicine ought to be entirely avoided while taking the Ervalenta, unless it be expressly prescribed by the medical attendant. Should medicine, however, be taken, the use of the Ervalenta ought not to be discontinued.

"N.B.—Many persons with whom fruit and vegetables disagree, will find that by making use of the Ervalenta they will be enabled to digest them without difficulty.

CERTIFICATES AND TESTIMONIALS FROM EMINENT PHYSICIANS AND ANALYTICAL CHEMISTS, ETC.

DR. URE'S CERTIFICATE

Of the Analyses of 'Warton's Ervalenta,' and of a spurious imitation called 'Revalenta Arabica.'

"London, 24. Bloomsbury-square, 2nd December, 1847.

"I have analysed a sample of 'Warton's Ervalenta,' and find it to be a pure vegetable product, very nutritious, and easily digestible, possessing the very valuable property of removing and counteracting habitual constipation, and of establishing a regularity in the alvine discharge. The said 'Ervalenta' is, in *my opinion*, a perfectly wholesome dietetic.

'I have likewise analysed an imitation of 'Warton's Ervalenta,' lately ex-
ed and advertised for sale under the parodied but unmeaning title of 'Reva-
ta Arabica.' I find it not to be a pure vegetable meal, but to be disguised
h coloured powder, and to be mixed with a quantity of extraneous saline
tter; additions which are most undesirable. The said 'Revalenta Arabica'
different, therefore, from the genuine ('Warton's') 'Ervalenta,' which is
ure vegetable product, of a much more agreeable taste, and lighter on the
mach than the imitation substance called 'Revalenta Arabica.'

ANDREW URE, M.D., F.R.S., &c. &c.,
Professor of Chemistry, and Analytical Chemist.

Dr. Ryan's Certificate

f the Analyses of 'Warton's Ervalenta,' and of a spurious imitation called 'Revalenta Arabica.'

"Royal Polytechnic Institution, London, March 22, 1848.

"I hereby certify that I have analysed a sample of 'Warton's Ervalenta,' and
d it to consist of pure vegetable matter. Its nutritious properties are of the
ry highest order; it forms an extremely pleasant article of food, and is easily
gestible by the weakest stomachs.

"I find, also, from my own experiments, as well as from the evidence of nume-
us medical men who have recommended the 'Ervalenta' to their patients,
at it possesses the invaluable property of removing habitual constipation, and of
oducing regular and healthy alvine evacuations, without the aid of any aperient
edicine.

"I have also analysed a sample of a substance called 'Revalenta Arabica,'
ld, I believe, ostensibly with the same object as 'Warton's Ervalenta.' I
d that it does *not* consist, like the Ervalenta, of pure vegetable materials, but
ntains certain proportions of saline and artificial colouring matter, giving to
a medicated taste and character.

JOHN RYAN, LL.D., M.D., M.R.C.S.E.,
Formerly Lecturer on Materia Medica and Therapeutics at the Charlotte-street Schools of Medicine, Bloomsbury; Professor of Chemistry to the Royal Naval College, Portsmouth, and to the Royal Polytechnic Institution, London.

CERTIFICATE OF PROFESSOR DR. MUSPRATT'S ANALYSIS OF 'WARTON'S ERVALENTA.'

"College of Chemistry, Liverpool, March 8th, 1850.

"On analysing a sample of 'Warton's Ervalenta,' I find it to consist of the
ina of a leguminous plant, therefore purely vegetable in its origin.

"It yields 97·655 per cent. of organic matter, and 2·345 per cent. of inorganic
lts, consisting principally of earthy phosphates. The amount of nutrition it
tains is very large, and the vegetable matter is of such a nature as to relieve
inate constipation; while the inorganic salts will minister to the formation
bone and muscle.

"I regard it as an effective and nutritious dietetic, and by its use, collaterally
h proper regimen, the digestive functions may be completely re-established,
being brought into a healthy state—by the administration of so harmless
palatable a food—maladies will often be eradicated which have resisted the
severe medical treatments.

"We cannot enjoy perfect health unless the evacuations are regular and spon-
eous. The 'Ervalenta' is suitable for delicate stomachs, and is far more
itious than arrow-root and substances of a similar nature. If the constipation
ry obdurate, a syrup of stewed prunes may be taken with the 'Ervalenta.'
For giving a healthy tone to the stomach, salt, as a seasoning, should be used,
t greatly accelerates digestion.

SHERIDAN MUSPRATT, F.R.S.E.
Professor of Chemistry.

TIFICATE OF THE ANALYSIS OF LLOYD BULLOCK, ESQ., OF 'WARTON'S ERVALENTA.'

"22. Conduit-street, London, March 25, 1848.

Having been requested by a physician, who takes particular interest in all
les of diet, to examine a sample of 'Warton's Ervalenta,' I can with con-

fidence state that it is a pure vegetable production, suitable for delicate stomachs, far more nutritious than arrow-root, or the like substances, and I think it worthy of general adoption.

LLOYD BULLOCK,
Analytical Chemist.

DR. PETTIGREW'S TESTIMONIAL OF 'WARTON'S ERVALENTA.'

"7. Chester-street, Belgrave-square, London, Oct. 5, 1849.

"I have much pleasure in recommending Mr. Warton's 'Ervalenta,' as an article of diet. It is decidedly more nutritious than most of the farinaceous foods, and I have found it in many cases remove habitual constipation.

W. VESALIUS PETTIGREW, M.D., F.R.C.S.E.
Lecturer upon Anatomy and Physiology at St. George's
Hospital, London, &c.

DR. SIGMOND'S TESTIMONIAL OF 'WARTON'S ERVALENTA.'

"Baker-street, London, April 4, 1848.

"Having had opportunities of becoming acquainted, whilst in France, with the farinaceous fecula, 'Warton's Ervalenta,' I have recommended it as a dietetic of easy digestion, of very nutritive power, possessing a gently aperient effect, and have found it uniformly serviceable in the cases for which I have directed its use.

G. G. SIGMOND, M.D.

TESTIMONIAL OF F. FENWICK, ESQ.

"Ulgham House, Morpeth, Northumberland, Jan. 8. 1849.

"DEAR SIRS,—I beg to thank you for your suggestions relative to my diet, &c., and for your very kind inquiries respecting my health. I am happy to inform you that I still continue to derive much benefit from the use of Ervalenta. In short, the astonishing effects which it has produced in restoring the digestive functions, and rendering the alvine evacuations regular, have indeed very far exceeded my most sanguine expectations. In a word, I may now say, I know what it is to enjoy the blessing of tolerable good health—I say *tolerable*, because, after suffering from indigestion and violent habital constipation of more than thirty years' standing, I could not expect ever to enjoy *perfect* health.

"Your London agent would, I have no doubt, inform you how grossly I had been imposed upon by Du Barry and Co., the proprietors of that *vile and spurious* article called *Re*valenta, (got up in imitation of your excellent farina, *Er*valenta,) a canister of which they sent me to try; on my objecting, however, to make use of it, unless they were prepared to show that it was perfectly free from admixture of drugs, they had the barefaced assurance to assert that it was '*a pure vegetable production free from any admixture whatever*.' Being thus assured, I was induced to give it a trial on three different occasions; but so violent were the effects which it produced, in griping and purging, that it made me exceedingly ill, and I thus discovered that their assertions were base and wicked falsehoods, framed to suit their own sordid designs. I now find that it has been analysed by Drs. Ure and Ryan, both of whom attest to the presence of drugs, &c.,—thus proving Du Barry and Co. to be a set of unprincipled fellows, which I have already told them in the most *direct terms*.

"I find that a lady, with whom I am acquainted, who wished to make use of your invaluable farina, Ervalenta, had, by mistake, procured a canister of *Revalenta*, which, after she had used it three or four days, produced a similar effect upon her, in consequence of which she was confined to her bed for some days.

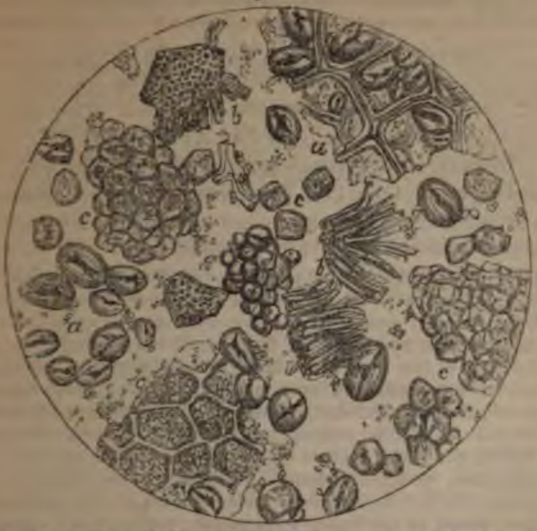
"Besides the mischievous effects produced by Revalenta, it is more costly, and requires more care and attention in cooking than Ervalenta, and, when prepared, is not, like that farina, an agreeable and pleasant food, but a nauseous and viscous preparation, more adapted for pig-wash.

"Should this, or any other communication of mine, be of any service to you, you are perfectly at liberty to make any use of them you may think proper.

I remain, dear sirs, very faithfully yours,
FRANS. FENWICK.

"To Messrs. Warton & Co.,
9. St. Martin's-place, Trafalgar-square, London."

Fig. 84.



Sample of WARTON'S ERVALENTA, as it appears under the microscope. *a a*, starch-corpuscles of the FRENCH LENTIL; *b b*, fragments of the husk; *c c*, starch-granules and masses of the substance resembling INDIAN-CORN MEAL.

ANALYSIS OF WARTON'S ERVALENTA.

(The sample analysed was purchased at the depôt, 9. St. Martin's-place, Tra-ar-square.)

his article consists of a mixture of the *French or German lentil*, ground and uced to powder, including portions of the shells or husk, and of a substance y closely resembling in its microscopic characters *maize* or *Indian-corn meal*. he French lentil, either whole or ground, is of a yellowish colour, and has taste of peas.

t has been stated that the farina of a grass called "Dari," "Durra," &c., has n discovered in either Ervalenta or Revalenta.

We have succeeded in procuring a sample of this article, and find it so closely semble maize in structure, that it is nearly if not quite impossible to distin-ish with certainty the one from the other, when ground and mixed with other icles.

"Dari" is occasionally imported into this country, and sold at about twenty-r shillings per quarter, that is, at the rate of rather more than one-halfpenny pound.

t is therefore possible that the article which we have detected in Warton's alenta may be the "Dari," or "Durra," &c., referred to.

e have received from Dr. Pereira the following information respecting urra."

Dari, I suspect means *Durra*, also splelt *Doura*, *Dorv*, &c. It is a corn by the Arabs, and is cultivated in the south of Europe. It is the *Holcus a sativus* of Förskäl, the *Sorghum vulgare* of some other writers.

Its meal is said to resemble that of Indian corn. Now it deserves notice, a German microscopist recently stated that he found the meal of Indian in *ervalenta*, or *revalenta*, I forget which. Did he mistake it for the Sorg-?"

the foregoing woodcut the several structures discovered with the micro-in Warton's Ervalenta, are accurately delineated.

he article sold in bottles at 1*s*. per lb., and recommended to be used in of obstinate constipation with the Ervalenta, appears to be nothing more treacle, the name "Melasse" being derived from the word molasses.

DU BARRY'S REVALENTA ARABICA.

(*Copied from Circular.*)

"DIRECTIONS FOR THE USE OF DU BARRY'S
HEALTH-RESTORING FOOD,
FOR INVALIDS AND INFANTS.
THE REVALENTA ARABICA,
Discovered, exclusively grown, and imported by
DU BARRY & Co., 127. NEW BOND-STREET, LONDON,

" Sole owners of the Revalenta Estates, and of the Patent Machine by
alone the curative principles of the plant can be developed.

"This light delicious breakfast farina (without medicine of any kind, witho
convenience, and without expense, as it saves fifty times its cost in other mo
pensive remedies) speedily and permanently removes, dyspepsia, (indiges
constipation, acidity, cramps, spasms, fits, heartburn, diarrhœa, nervous
biliousness, affections of the liver and kidneys, flatulency, distention, palpi
of the heart, nervous headache, deafness, noises in the head and ears, pains
most every part of the body, chronic inflammation and ulceration of the sto
eruptions on the skin, scrofula, consumption, dropsy, rheumatism, gout, n
and vomiting during pregnancy, after eating, or at sea, low spirits, spleen,
ral debility, paralysis, cough, asthma, inquietude, sleeplessness, involu
blushing, tremors, dislike to society, unfitness for study, delusion, lo
memory, vertigo, blood to the head, exhaustion, melancholy, groundless
indecision, wretchedness, thoughts of self-destruction, &c. The best fo
infants and invalids generally, as it is the only food which never turns a
the weakest stomach, but imparts a healthy relish for lunch and dinner, a
stores the faculty of digestion and nervous muscular energy to the mos
feebled.

DU BARRY & Co., 127. NEW BOND-STREET, LONDON.

Analysis by the celebrated Professor of Chemistry and Analytical Che
ANDREW URE, M.D., F.R.S., &c.

" London, 24. Bloomsbury-square, June 8

"I hereby certify, that having examined Du Barry's Revalenta Arabica,
it to be a pure vegetable farina, perfectly wholesome, easily digestible,
to promote a healthy action of the stomach and bowels, and thereby to
teract dyspepsia, constipation, and their nervous consequences.

ANDREW URE, M.D., F.R.S., Analytical Che

" London, Aug. 1

"Dr. Harvey presents his compliments to Messrs. Du Barry & Co., a
pleasure in recommending their 'Revalenta Food;' it has been singularl
ful in many obstinate cases of diarrhœa, as also of the opposite condition
bowels, and their nervous consequences.

"DU BARRY'S REVALENTA ARABICA FOOD.

"In preparing it for breakfast for a person in general good health, mi
two, or three ounces, like gruel, in a pint or more of water, good mil
better, cream and water, or beef-tea; boil and stir it over a slow fire,
earthen or porcelain-lined saucepan, for fifteen minutes, adding salt t
taste whilst boiling, and best Jamaica moist sugar, or fresh butter, or
when placed on the table. It may also be flavoured with honey, vanilla, a
stewed prunes, raspberry, strawberry, or any other cooked fruit.

"For supper, say one or two hours before bed-time, mix one, two, o
ounces, for each person, in a pint or more of good milk, or water, crea
water, or beef-soup without grease, and boil it for fifteen minutes over
fire, stirring well to prevent its getting lumpy or burning at the bottom.
may be added to your taste, but no pepper nor any other stimulant. D
ladies, and children of three months and upwards, thrive best on two m
day, of from one to two ounces each, of the super-refined quality. The qu

cases to be regulated so as to suit and rationally satisfy the appetite. ead or other food to be eaten with it at any time, nor for an hour before er.

irections for the Cook.—An ounce of the food is equal to a good table-ful. The Revalenta mixes best when treated like common flour—a small ty of lukewarm water well stirred with the one, two, or three table-fuls will dissolve the food quite smooth, when it may be poured into the quantity of warm water in which it is to be boiled. Let it be boiled r than a custard, but regulate the quantity of water you use in such a er that it may boil fifteen minutes, stirring all the time, before it arrives t consistency or thickness.

.B.—The 'Revalenta Arabica,' kept in a dry place, in its own canister, tain its properties for years, and may also be sent into any climate. one genuine without our seal and signature, thus—

Du Barry & Co.

he imitation of either is guarded against by the penal statutes. All erfeiters will be rigorously prosecuted.

f all the popular delusions, there is none more generally received, or more ctive of injury to invalids and weakly children, than the reliance placed ow-root for their nourishment. In our own days of delusion we have loads of it, and acquired practically the firm conviction that so much sand have benefited us as much. We consider it as inert matter, devoid of shment, harmless to rustic stomachs, but extremely injurious to weak and ered ones; and for these latter its use cannot be too strongly deprecated, ally in the case of delicate children, many of whom are rendered miserable, ften sacrificed, by being fed on the above substances, or on tops and ns, the most indigestible and constipating food for infants of too tender assist digestion by bodily exercise.

PRICES OF THE REVALENTA* ARABICA FOOD IN THE UNITED KINGDOM.

		£	s.	d.
In London, Canister at gross weight	1 lb. - -	0	2	9
,, ,, ,,	2 lb. - -	0	4	6
,, ,, ,,	5 lb. - -	0	11	6
,, ,, ,,	12 lb. - -	1	2	0
THE SUPER-REFINED QUALITY.				
,, Canister gross weight	5 lb. - -	1	2	0
,, ,, ,,	10 lb. - -	1	13	0

ch canister is accompanied with full directions for use, and for the pre-ion of the virtues of the 'Revalenta' for years.

B.—Children of three months and upwards, and delicate ladies, thrive best or three meals per day, of the super-refined quality, boiled in water, beef-tea, or mutton-broth.

r Consultations apply direct to Mr. Du Barry, stating minutely symptoms, and date of ailment, age, occupation habit of body and mind, mode of ual diet, past treatment, &c."

(Copied from second Handbill.)

"IMPORTANT CAUTION!

e common forger of Bank of England notes either imitates them boldly, oduces an additional or modified appellative, thus:

---

word 'Revalenta,' pronounced by the Arabs and Bedouins 'Reval-Yenta,' may be translated storer,' or 'The Renovator.' Its origin may be traced in the Sanscrit, where it corresponds to verb Revalescere, sco. 'Ex capitali morbo revalescere.' OVID. 'To recover from a deadly s.' Philologists will find this note superfluous; but it may serve as an additional safeguard ady imitations, by which the unscrupulous are trying to impose upon the public under a variety ing names, such as Ervalenta, Relaventa, and all sorts of 'ventas,' the plain English of which ar to be no other than that implied by a desire to raise the wind upon the unwary and illiterate."

BANK OF ELEGANCE NOTES!
'REAL' BANK OF ENGLAND NOTES!
or
'similar to' BANK OF ENGLAND NOTES!

(the words 'similar to' being in small type, so as to escape attenti assist the deception), which, neatly engraved, may deceive the unwary.

"A similar process of deception has been tried by FIFTY DIFFERENT G SWINDLERS! who, too lazy to work honestly for their living, try to le tributions on the credulous or superficial, by offering them trashy comp peas, beans, lentils, Indian and oat meal, worth about 1*d*. per lb., und imitation of the name of

DU BARRY'S
INIMITABLE REVALENTA ARABICA FOOD.

"Messrs. DU BARRY & Co. have taken the trouble to analyse these m imitations, and found them excellently adapted for PIGS, but, being res heavy, irritating, and heating, they would play sad havoc with the stomach of an invalid or infant.

"Let the public examine carefully the exact spelling of Du Barry's Restoring Food,

THE REVALENTA ARABICA;

and note that their seal and signature in full,

DU BARRY & CO.,

are attached to each canister, the imitation of either of which is a pena leading to TRANSPORTATION.

"Let, therefore, no one be deceived by having, instead of

DU BARRY'S 'REVALENTA ARABICA FOOD,'

thrust into his hands:—

'Real Evorlenta,'
'Real Ervalenta,'
'Real Relaventa,'
'Real Ravalenta,'
'Real Arabian Revalenta,'
'Lentil Powder, similar to R Arabica.'
'Pease-meal, similar to R Arabica.'
'Oatmeal, similar to Revale bica.'

Or any other of the fifty-six ''VENTAS,' which knavery has already thrust upon the public in imitation of Du Barry's inimitable Revalenta Food; and which have nothing to recommend them but the reckless au their unscrupulous compounders, and their still more unscrupulous a *procuresses*—alias *professors*—who, for the sake of a guinea fee, w hesitate to pollute or poison the whole United Kingdom, by *recomme those who require our utmost solicitude that which is the most injurious t*

"CRUEL DECEPTIONS ON INVALIDS EXPOSED.

"The health of many invalids having been fearfully impaired by spurio pounds of peas, beans, lentil, Indian and oat meal, palmed off upon the closely similar names, such as Ervalenta, Arabica Food, Lentil Powder, Flour of Lentils, &c., and which are generally accompanied with a test from Dr. Ure, or some unfortunate M.D. without name or practice, Me Barry have taken the trouble of analysing all these spurious imitations, them to be harmless as food to the healthy, but utterly devoid of all principles; and being of a flatulent and irritating tendency, they are m adapted to cure disease than oil to quenching a conflagration. They indeed, play sad havoc with the delicate stomach of an invalid or infa for this reason the public cannot too carefully avoid these barefaced atte imposture. Moreover, whilst Du Barry's Revalenta Arabica has 50,000 testimonials of cures from parties of the highest respectabilit imitative impostors cannot show a single cure; nor is it likely they ev for the medicinal use of their compounds is calculated to produce no o

ous results. Dr. Ure errs considerably in the certificates he grants to
ndors. The Lentil is correctly described in Gray's Supplement to the
copœia, as follows—viz.,
vum Lens (*Linn.*) *difficult of digestion, astringent, hurtful to the eyes;*
the Ervum Ervilla produces weakness of the extremities; horses fed upon
e almost paralysed.—In the *Gardeners' Magazine of Botany*, we find
l that the Lentil, notwithstanding its nutritious nature, *is difficult of*
a and subnarcotic.'

se characteristics of the Lentil we have invariably observed in countries
his flour is mostly used; thus, in France, where the Lentil is a very
dish among all classes, dyspepsia, constipation, flatus, nervous com-
&c. flourish more generally than in any other part of the world.

ley-flour, also, is difficult of digestion (see THE LANCET, p. 420.), and
y devoid of curative properties. Nor have colouring and saline matters
g to recommend them as curative agents. Yet nearly all the imitators of
ry's 'Revalenta Arabica Food' publish certificates with the name of
at the bottom, setting forth the wonderful superiority of those imitations,
erting in one of them that the original Du Barry's 'Food' contains
g and saline matters; in another, 'Lentil-flour' and 'Barley-flour;'
ext they will probably add a little prussic acid, or some other variation.
rder to expose this absurd certificate-vending system, we got this same
to analyse our Food, and after he had already sold several certificates
tors, in which he had declared it to contain saline and colouring matter,
lt of his analysis was as follows: —

' London, 24. Bloomsbury-square.

ereby certify, that having examined "Du Barry's Revalenta Arabica," I
to be a pure vegetable farina, perfectly wholesome, easily digestible,
promote a healthy action of the stomach and bowels, and thereby to
ct dyspepsia, constipation, and their nervous consequences.

'ANDREW URE, M.D., F.R.S. &c., Analytical Chemist.'

believe this is the only correct certificate Dr. Ure ever wrote about our

, for the purpose of exposing these attempted impostures, Messrs. Du
Co. purchased in June, 1850, the sole licence of Nevill's patent for
and selling Patent Lentil-flour, and thus placed this article before the
6*d*. per packet, and enabled any one to make the comparison between
-curative flour and the curative Revalenta Arabica Food. No sooner
ssrs. Du Barry & Co. purchased this licence, and thus exposed the
us hitherto practised, than a fresh attempt of a similar nature is made
A. H. Nevill, the same person from whom, for the purpose above-
ed, we purchased the Lentil Patent. This misguided young man,
found it difficult to sell lentils at 2*d*. per lb., introduces an improvement
e system hitherto pursued by other imitators of Du Barry's Revalenta
Food, and certainly shows some ingenuity. He calls his lentils (which
ply Egyptian lentils) 'Arabian Lentils,' and the flour 'Arabica Food,'
r lb.; buys a certificate from Dr. Ure, declaring the Lentil-flour *per-*
holesome, and counteracting a variety of complaints! We think Dr. Ure
ot, in case of illness, rely upon the pretended curative properties of

have quoted above, from works which are not open to bribes, the real
r and nature of the Lentil; and in our report of cures effected by our
ta Arabica Food will be found many testimonials from parties who
that they had been made very ill by the Lentil imitations. Dr. Ure's
es, therefore, do not appear to improve the nature of these spurious and
imitations. But Mr. Nevill is not satisfied with backing his Lentil-
h a fictitious name, and a certificate from Dr. Ure and some obscure
he goes farther: he declares that Messrs. Du Barry and Co. buy lentils
n, and pay him an annual sum for manufacturing the Revalenta
thus adding two more glaring untruths to the many he expects the
ll swallow. The barefacedness of these untruths will be found in the
letter from our solicitors: —

'15. Furnival's-inn, London, April 30th, 1851.

"'Dear Sir, — The effect of the deed between Mr. Nevill and yourself, dated 15th June, 1850, is to give you the exclusive licence, upon certain terms, of making and selling lentil-flour, for which Mr. Nevill had obtained a patent, reserving to Mr. Nevill, personally, the use of his patent.

"'*No mention is made in the licence* of manufacturing the Revalenta Arabica, and from what we have learnt from you, we believe your object in taking the licence from Mr. Nevill was to prove the difference existing between Mr. Nevill's Flour of Lentils and the Revalenta Arabica.

'Jas. Taylor & Mason, Solicitors.'

The only lentils we ever bought of Mr. Nevill was a small quantity shortly after we took his patent; but the greater portion of them we had to sell for pig's food, as, upon an analysis, we found the article most undesirable for the use of invalids. This was towards the latter part of last year; since then we have not even seen lentils! So much for Mr. Nevill's insane fabrications, and Dr. Ure's absurd certificates! What credit can henceforth be attached to the statements of either?"

(*Copied from a third Circular.*)

"*From the Morning Chronicle.*

"'It is ever a pleasing duty of a journalist to introduce to his readers some new discovery calculated to benefit a vast portion of our fellow-creatures, which has the strongest claims upon our sympathies. It is with this feeling that we call the attention of invalids to "Messrs. Du Barry's Revalenta Arabica Food," a farina which careful analysis has shown to be derived from the root of an African plant, somewhat similar to our honeysuckle. It appears to possess properties of a highly curative and delicately nutritive kind; and numerous testimonials, from parties of unquestionable respectability, have attested that it supersedes medicine of every description, in the effectual and permanent removal of indigestion (dyspepsia), constipation, diarrhœa, &c.'

"An allusion to Du Barry's Revalenta Arabica Food having been made in Chambers's excellent Journal, which appeared liable to be misconstrued by the superficial reader, Messrs. Du Barry and Co. addressed a note to the Editor, and had the satisfaction of receiving the following polite reply: —

'Edinburgh, Dec. 12. 1849.

"'Sirs, — I am free to assure you that I have no ill will whatever to your preparation, which I have heard well spoken of in respectable quarters, and may very likely order for a trial on my own account ere long.

'I am, Sirs, your obedient servant,

'R. Chambers.'

"The high respectability of the Messrs. Chambers alone induced Messrs. Du Barry and Co. to apply for an explanation: of scurrilous and disreputable papers they take no notice."

Analysis of Du Barry & Co.'s Revalenta Arabica.

(The first sample analysed was purchased of J. Revell, 272. Oxford-street.)

This article was found to consist of a mixture of the *Egyptian* or *Arabian lentil* and *barley-meal*.

(The second sample was obtained from the depôt, 127. New Bond-street.)

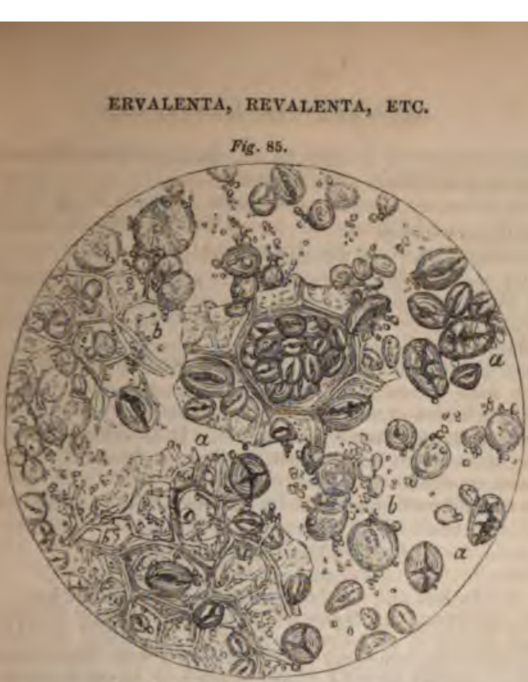
This sample was found to consist, like the first, of a mixture of the *red* or *Arabian lentil* and *barley-flour*, sweetened with *sugar*.

A *third* sample consisted of the *Arabian lentil* and *barley-flour*, with the addition of *saline matter*, principally *chloride of sodium* or common salt; it also possessed a peculiar taste, as though flavoured with *celery-seed*.

While Warton's Ervalenta is of a yellowish colour, Du Barry's Revalenta is of a pink or rosy hue; this arises from the different species of lentil employed, the German being yellow, and the Arabian lentil of a red colour.

The taste of the first of the three samples of Du Barry's Revalenta submitted to analysis could scarcely be distinguished from that of pea-flour; that of the second sample was much more agreeable, owing to the quantity of sugar which it contained; while in the third sample the salt and peculiar flavour already referred to as resembling that of celery-seed could be distinctly recognised.

Fig. 85.



Sample of Du Barry's REVALENTA ARABICA.
a a, starch-granules of the ARABIAN LENTIL, some loose, others lying in the cells of the cellulose; *b b*, starch-granules of BARLEY-FLOUR.

The structures detected in the first of the samples examined are faithfully exhibited in the engraving.

Du Barry & Co., as appears from the circulars quoted, sell, in canisters of not less than 5 lbs. each, price 22*s*., what they term a "super-refined quality" of Revalenta. Having, as we conceive, too just an appreciation of the value of money, we have not possessed ourselves of a canister of this description of the article, and therefore are unable to give an analysis of it.

They also sell a syrup, "carefully packed in 7*s*. bottles," and recommended to be employed in obstinate constipation. We preferred our money to the syrup, and therefore did not purchase any.

It will be observed that under the heading "Cruel Deception on Invalids Exposed," Du Barry & Co. make quotations condemnatory of lentils and barley-flour, and as these enter largely into the composition of their own article, by inference this is condemned even on their own showing.

BUTLER & M'CULLOCH'S PREPARED LENTIL-POWDER.

(*Copied from Handbill.*)

"BUTLER & M'CULLOCH'S
PREPARED LENTIL-POWDER,
for
INVALID'S FOOD.
Being an article similar to that vended as
REVALENTA ARABICA FOOD.

"Lentil-Powder, a light and nutritious diet for invalids, is a food above all others adapted for persons of weak digestion, and infants, as the following certificate of the well-known chemist, Dr. Ure, F.R.S., will testify.

Copy of the Certificate of the well-known Analytical Chemist,
DR. ANDREW URE, F.R.S.

"London, 24. Bloomsbury-square, Nov. 2. 1849.

"I hereby certify, that having examined a sample of Lentil Powder, manufactured and sold by you, I find it to be of the purest and finest quality, and well adapted, as that substance is known to be, for the relief of all ailments o stomach and bowels caused by constipation.

ANDREW URE, M.D., F.R.S., &c.
Analytical Chemist and Professor of Chemi

" To Messrs. Butler and M'Culloch.

" This nutritious light, and agreeable food is confidently placed before public upon its real merits, without resorting to any assumed or ambig terms, feeling confident, from its superiority, it will gain its way with the pu Its use entirely supersedes medicine in ordjnary ailments, such as indigest flatulency, inflammation, congestion, biliary obstruction, fistula, water-br and sickness during pregnancy. It is the best food for children, as it ne like most other food, turns acid upon the stomach, and is proved by chem analysis to contain more nutritious substance than any other farina; and b of such easy digestion, is most invaluable. It is offered to the public moderate price, in order to bring it within the reach of all, as by its use food, other more expensive articles are dispensed with .

" Packed in canisters of one lb., at 1*s.* 6*d.*; two lbs., 2*s.* 6*d.*; four lbs., 4*s.* eight lbs., 9*s.*; and twelve lbs., 12*s.*

Prepared and sold genuine by
BUTLER AND M'CULLOCH,
Herbalists and Seedsmen, Covent-garden-market."

ANALYSIS OF BUTLER AND M'CULLOCH'S " PREPARED LENTIL-POWDE

(The sample submitted to analysis was purchased of the proprietors.)

It was found to consist entirely of the *French* or *German lentil.*

EDWARDS BROTHERS'
ARABIAN REVALENTA.

(Copied from Label on Packet.)

" Half-pound Sixpence.
ARABIAN REVALENTA,
A delicious food which supersedes medicine.

" Hitherto sold at from 2*s.* 9*d.* to 9*s.* per pound, but now offered at 1*s.* pound, or three pounds for 2*s.* 6*d.*, in order that every class of the commu may enjoy the benefit of its use.

" It is the produce of an Arabian plant, prepared as a farinaceous pow and has obtained a wide celebrity for its valuable effects as a soft, healing, a nutritious, and wholesome

Diet for Invalids, as well as for Healthy Persons.

" It forms a very excellent breakfast or supper food, is valuable for sou custards, puddings, children's food, &c., is easily prepared, and is agreeable every palate.

" Purchasers are respectfully requested to observe that each packet is sig
Edwards, Br

ALBION MILLS,
Blackfriars'-road, London."

ANALYSIS OF EDWARDS, BROTHERS' " ARABIAN REVALENTA."

(The sample analysed was purchased of E. Nettleford, 3, New Church-str Portman-market.)

The sample was ascertained to consist of *lentil-powder*, the colour being as would be produced by a mixture of the two species of lentil, the red and yellow, and the latter in the larger proportion.

NEVILL'S PATENT FLOUR OF LENTILS.

(Copied from Wrapper.)

" NEVILL'S
PATENT
FLOUR OF LENTILS.

ntils, as is well known, contain more nutriment, and possess those c d healing properties that are not found in any other vegetable product rsons suffering from indigestion, constipation, or other derangement of the gestive organs, stomach, intestines, liver, &c., should persevere with the use f the 'Patent Flour of Lentils' for a short time, introducing animal food gra- ally as the stomach gains strength, carefully avoiding anything that subjects he digestive organs to excessive labour without yielding adequate nutriment."

ANALYSIS OF NEVILL'S PATENT FLOUR OF LELTILS.

(The first sample was purchased of Marshall & Co., 17. Adams-row, Hamp- ead-road.)

This article consists of a mixture of the *red* or *Arabian lentil*, with a propor- ion of *wheat-flour*.

(The second sample was purchased of J. Revell, 272. Oxford-street.)

The sample was found to consist of a mixture of the *Arabian lentil* and *barley- our*, in the proportion of two-thirds of the former to one-third of the latter.

It will be observed that this article is analogous in its composition to Du Barry's Revalenta Arabica, and that it consists of a mixture of the *Arabian entil* and *barley flour*. It appears to be carefully prepared, the hull being en- irely removed; while the price, 1*s*. per pound, is little more than one-third the ost of either "Warton's Ervalenta," or "Du Barry's Revalenta."

Lentils belong to the natural family of plants, *Leguminosæ*, which includes the several kinds of beans and peas; they resemble, to a very great extent, in colour, structure, taste, and properties, the common pea; so great, indeed, is the similarity in organization, that it is difficult to discriminate between them, ven by the aid of the microscope.

Lentils, peas, beans, &c., all contain a considerable amount of nitrogenized atter, in the form of *Legumine*; when taken as an article of diet, they are und by most to be somewhat difficult of digestion, to occasion distention and tulency, and to be slightly aperient. These properties and effects are so milar in the case of each, that it is almost impossible to draw any decided line f demarcation between them.

"Purified lentils" are prepared under a patent, by Mr. Nevill, who formerly pplied Du Barry & Co. with the article, at 10*l*. per ton; that is, at about one nny and a fraction per pound.

The admixture of barley and other flours with lentil powder is not to be arded in the light of an adulteration, since the cost of barley-flour exceeds t of the lentil, being about 13*l*. per ton.

The object of this mixture is chiefly to diminish the strong flavour of the len- , and which is so disagreeable to many. Messrs. Du Barry and Co. still more tually accomplish this object, in some cases, by the addition of sugar.

Extremes meet: lentils being somewhat cheaper than peas, are supplied to ny of our workhouses, to be used in the preparation of soup, &c. Thus they not only consumed by paupers, but by the rich, the chief difference being, t the latter frequently pay 2*s*. 9*d*. per pound for them.

As the cost of most of the prepared lentil powders—viz., 2*s*. 9*d*. per pound— ms a very serious obstacle to their use, supposing that in any respect it is irable that they should be more generally consumed, we have framed the two owing receipts, whereby a considerable saving of expense may be effected:—

1st Receipt.

Red or Arabian lentil-flour - - -	2 lbs.
Barley-flour - - - - -	1 lb.
Salt - - - - - -	3 oz.

Mix into a uniform powder.

he "directions for use" it is unnecessary to detail, as they have been already y given in the prospectuses printed above.

he red lentil may be obtained of almost every corn chandler, at about 4*d*. quart; the cost of a pound of *our* Ervalenta would be about 2*d*. per pound; it is perfectly clear, from the analyses which we have given above, that ever may be the advantages possessed by the much-vaunted Ervalentas, alentas, &c., that our article must contain them all.

2nd Receipt.

Pea-flour - - - -	- 2 lbs.
Indian corn flour - - -	- 1 lb.
Salt - - - - -	- 3 oz.

Mix as before.

Being satisfied that lentils and peas do not differ in their properties to any great extent, we have devised the above receipt to meet those cases in which any difficulty may be met with in procuring the red lentil, which however is now very commonly kept by corn chandlers.

Whatever may be the results of the experience of others as to the advantages derived from the use of lentil-powder, we ourselves are unable to say very much in its favour.

We recently partook of some of Du Barry's Revalenta Arabica, and found the flatulent effects so unpleasant that we should not readily be induced to repeat the experiment.

As treacle exerts a slightly aperient action when taken in considerable quantity, it may be used, if desired, with either of the ervalenta mixtures, the receipts for which we have given above; it has a great advantage over "Melasse" and "Purified Syrup" in price, costing only 4*d.* per pound.

In the course of our observations, we have had occasion to refer frequently to Du Barry and & Co. The name of the person who represents Du Barry is Christian Klug, said to be a German Jew.

A few observations on the subject of scientific testimonials will form not an inappropriate conclusion to this report.

Science is never so important as when applied to the welfare and happiness of mankind, and it ought to be the object of every scientific professor to apply to the utmost of his power his own individual knowledge and experience to the benefit of his fellow-men. We regret to observe that this rule is not always acted upon, but a practice almost the reverse, and that there are many men so forgetful of the true objects of science and of their own honour, as not to hesitate to give certificates, and lend the support of their names to all kinds of quackery and schemes calculated to impose upon the public.

This practice, indeed, has of late become very notorious, and deserves the severest condemnation; for not only do the public suffer, but science itself is brought into contempt.

No proposition is too gross or absurd, but that, by the aid of a few guineas, certificates bearing the names of apparently respectable authorities may be procured, whereby it may be palmed off upon the public.

A manufacturer wishing to bring before the world—under scientific recommendation—some article which he prepares, despatches samples of excellent quality to various professors and others, together with a fee, and the request to be furnished with testimonials; this request is in general readily complied with, and a certificate is drawn up in such terms as to inspire the public with confidence in the superior qualities and excellence of the article, whatever it may be. This course is radically and morally wrong; and we consider that certificates founded on the examination of a single sample emanating from interested parties, and capable from their wording of being applied to all subsequent samples of the same article however inferior they may be, ought not in any case be given.

ON FARINACEOUS FOODS,

THEIR COMPOSITION, ETC.

GARDINER'S ALIMENTARY PREPARATION.

(*Copy of Label on Wrapper.*)

"BY ROYAL LETTERS PATENT,

GARDINER'S ALIMENTARY PREPARATION.

"This valuable production, prepared, as it is, after the instructions of the celebrated Professor Liebig, with a due proportion of nitrogenous matter, indispensably requisite for nourishment, of which sago, arrowroot, tapioca, and other farinaceous substances introduced to the public, are utterly devoid, will not be the mere fashion of a day, but remain a standard article of food, from its nutritive qualities and remarkable delicacy of flavour.

"It is especially adapted for children from the earliest period; for invalids and all those who suffer from weak digestion or irritable stomach; while for the healthy it produces many palatable delicacies for the table, as enumerated with the directions.

"The proprietor has not ventured to bring this diet before the public until he had submitted it to the notice of very many families and to some of the first medical men, who have been most urgent to recommend its use.

Prepared at the
RANELAGH WORKS, THAMES BANK, PIMLICO.
Single canister 1*s.* 6*d.*; double canister, 2*s.* 6*d.*

"In cases of cholera and diarrhœa, this invaluable preparation has been found to afford immediate relief

"None other genuine, unless signed and sealed,

John Gardiner."

Analysis of Gardiner's Alimentary Preparation.

(Obtained from the Proprietor.)

This preparation consists entirely of RICE, reduced to the state of an extremely fine powder, which crepitates, under pressure, in the same manner as do most of the arrowroots.

LEATH'S ALIMENTARY FARINA,
OR
HOMŒOPATHIC FARINACEOUS FOOD.

(*Copy of Label on Canister.*)

"LEATH'S ALIMENTARY FARINA, OR HOMŒOPATHIC FARINACEOUS FOOD.

"This preparation is recommended, on high medical authority, as a nutriment peculiarly adapted for the use of infants, invalids, and of those whose digestive powers are impaired.

"*Directions for Use.*— Mix thoroughly one tablespoonful of the farina, one teaspoonful of fine pounded loaf sugar, and one tablespoonful of milk; then pour thereon boiling water sufficient for half a pint, gently simmer it for two or three minutes, and it is ready for use. — The above ingredients and proportions may be made to suit the taste and appetite of each individual.

"Prepared and sold at the Homœopathic Pharmacy, 9 Vere-street, Oxford-street; and also at No. 5 St. Paul's Churchyard.

"In one pound tins, 1*s.* 6*d.* half-pound tins, 10*d.*"

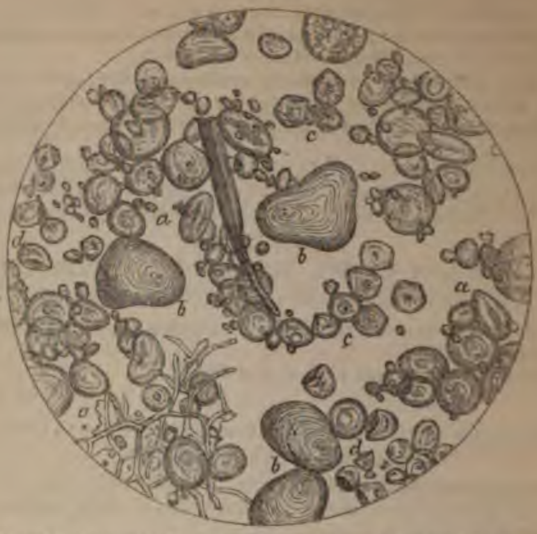
Analysis of Leath's Alimentary Farina, or Homœopathic Farinaceous Food.

(Purchased of J. Leath, 9. Vere-street, Oxford-street.)

This article consists principally of WHEAT-FLOUR, slightly baked, and sweetened with SUGAR, together with POTATO-FLOUR, and a very small quantity of INDIAN-CORN MEAL and TAPIOCA.

It will be observed that the quantity of the farina prescribed for a dose, as well as the price at which it is sold, are by no means infinitesimal or homœopathic. It is certainly a sad defect in "the system," that the same great principle (!) by which the doses of medicines are regulated by those consummate humbugs, homœopathists, is not applied by them to food, and that some such recipes as the following cannot be employed: — A crumb of bread, to be boiled for an hour in a gallon of water; one drop for a meal. One grain of beefsteak, to be boiled for the same length of time, in an equal bulk of water; one drop for dinner, every second day.

Fig. 86.



LEATH'S ALIMENTARY FARINA, OR HOMŒOPATHIC FARINACEOUS FOOD.
a a, starch granules of WHEAT; *b b*, starch-corpuscles of POTATO; *c c*, ditto of INDIAN-CORN MEAL; *d d*, ditto of TAPIOCA.

SEMOLINA.

ANALYSIS OF SEMOLINA.

(Purchased of J. Revell, 272 Oxford-street.)

This preparation consists of the GLUTEN OF WHEAT, with a certain prop of the STARCH, part of this having been removed.

Semolina resembles in appearance sago, but the little granules of whic composed, in place of being round, as in sago, are angular.

When moistened, the water is rendered perceptibly opaque and milky starch still present, and the fragments swell up and become soft and glutin

Semolina is not a proprietary article; it is kept by most corn chandler many grocers and oilmen.

BULLOCK'S SEMOLA.

(*Copy of Label on Package.*)

"BULLOCK'S SEMOLA,
A NEW
PREPARATION OF FOOD.
Highly Nutritious
And most Easily Digestible,
Adapted to
INFANTS
and
INVALIDS,

"Especially recommended to persons suffering from weak digestion or an of debility,—in the form of

GRUELS, PUDDINGS, SOUPS, &c.

"*Semola* contains five times the amount of the staminal principle of no ment found in wheat-flour, and may be added in any proportion to other a of diet for *infants* or *invalids*, so as to increase their nutritive power. Dire for preparing it are enclosed under the seal.

"22. Conduit-street. "*Lloyd Bullock*

ANALYSIS OF BULLOCK'S SEMOLA.

(Purchased of J. Sanger, 150. Oxford-street.)

Semola consists of the GLUTEN OF WHEAT, with a small proportion only of STARCH.

There is a very great resemblance in appearance between this preparation and Semolina, both consisting of granular fragments of the same size and form. No analysis was made to determine the amount of gluten present in either preparation.

PRINCE ARTHUR'S FARINACEOUS FOOD.

(*Copy of Label on Canister.*)

"PRINCE ARTHUR'S
FARINACEOUS FOOD,
For Infants and Invalids of all ages,
IS SUPERIOR TO ALL OTHERS.

No mother, nurse, or family, should be without it. (See *Times*, May 4th.)
Patronized and recommended by medical men of the highest distinction.
Manufactured by
PALMER & CO.,
1. Montague-terrace, De Beauvoir-square, Kingsland.
In half-pound Canisters, price 6*d*.
PRINCE ARTHUR'S
FARINACEOUS FOOD.

"DIRECTIONS FOR USE.

"Take a tablespoonful of the Food with a small quantity of cold water, mix to the consistency of cream, add half a pint of boiling water, constantly stirring, then boil it seven or eight minutes; add milk and sugar to taste.

"For grown persons equal parts of milk-and-water may be substituted for water. Sweeten and flavour to taste.

In half-pound Canisters, price 6*d*."

ANALYSIS OF PRINCE ARTHUR'S FARINACEOUS FOOD.

(Purchased of Haslett, 5. York-place, Commercial-road.)

This farinaceous food consists entirely of WHEAT FLOUR slightly baked.

PRINCE OF WALES'S FOOD.

(*Copy of Label on Canister.*)

"BY HER MAJESTY'S ROYAL LETTERS PATENT.
THE
PRINCE OF WALES'S FOOD.
Patronised by the Faculty.

"This article is decidedly superior to arrow-root, tapioca, isinglass, &c., and is strongly recommended by the highest medical authorities as the most nutritious diet for invalids and children ever discovered.

"It never becomes acid on the most delicate stomach, and retains its properties for an unlimited period in all climates.

"It is particularly valuable for culinary purposes, for thickening soups and gravies, and making delicious puddings, blanc-mange, &c.

"Full directions for use are enclosed.

"Prepared only by the PATENT FARINA COMPANY, and sold wholesale at their establishments, 14. Bucklersbury, London, and Seel-street, Liverpool. Sold wholesale at all the respectable medicine warehouses, and retail by all chemists and grocers throughout the kingdom.

"None is genuine unless signed by
J. Talbot.

Price 1*s*."

(*Copied from Circular.*)

"Patronised by the Medical Profession.

"The researches of scientific men have long been directed to the production of an article of food containing the greatest possible amount of nutriment without the alloy of generating acidity on the stomach. This grand desideratum has at length been happily attained by this unrivalled preparation, which is justly considered one of the greatest triumphs of vegetable chemistry of which the present age can boast.

"The highest medical authorities concur in pronouncing it the purest and most nutritious diet for children and invalids ever discovered. It contains not a particle of mineral or animal matter; and being entirely freed from acidity by the peculiar mode of preparation, it is admirably adapted for the use of dyspeptic patients, affording an elegant method of combining valuable medicinal properties with the luxury of a delicious meal.

"It is esteemed by epicures and domestic economists the greatest delicacy for thickening soups and gravies, and the production of exquisite custards, puddings, blanc-mange, &c., entirely superseding the use of arrow-root and isinglass, and producing a firmer and more permanent jelly at less than one-fourth the cost.

"A striking characteristic of this article is, that it materially improves by keeping, and retains its properties unimpaired in all climates.

Analysis of the Prince of Wales's Food.

(Purchased of Sanger, Oxford-street.)

This article consists entirely of POTATO-FLOUR.

HARDS' FARINACEOUS FOOD.

(*Copy of Label on Package.*)

"FARINACEOUS FOOD
For Infants and Persons with Impaired Digestion.
Manufactured by
JAMES HARDS,
DARTFORD,
Purveyor of the same, and Miller to her Majesty.
Highly approved and recommended by the Faculty.
"That only is genuine which bears the Royal Arms by authority, and is signed by
Jas. Hards.
Directions inclosed."

Analysis of Hards' Farinaceous Food.

(Purchased of J. Sanger, 150. Oxford-street.)

This preparation consists entirely of WHEAT-FLOUR, baked.

MAIDMAN'S NUTRITIOUS FARINA.

(*Copy of Label on Canister.*)

"None is genuine unless signed,
J. E. Maidman."

"J. E. MAIDMAN'S,
(Successor to J. Bright,)
NUTRITIOUS FARINA.

"For Invalids, Infants, or ordinary diet for those with weak digestive powers.

"Highly patronised and strongly recommended by the medical profession, as containing a large proportion of nutriment, being more economical, more sustaining, and easier prepared, than any other article of its kind ever yet offered to the public, AS IT REQUIRES NO BOILING, AND IS MADE IN TWO MINUTES.

"Its excellence is supported by numerous testimonials from medical gentlemen and public institutions, requiring only to be tried for its advantages over all other beverages for invalids and children, to be immediately discovered; and is also particularly adapted for hospitals, infirmaries, and large institutions, for its economy and the simplicity of its preparation for use.

"Sold in canisters at 1*s.*, 1*s.* 6*d.*, 3*s.*, and 6*s.* each, with directions for use, *testimonials*, &c., which have been received in its favour.

Wholesale at the Manufactory,
No. 5. Holland Street, North Brixton,
And retail by agents in town and country."

Analysis of Maidman's Nutritious Farina.

(Purchased of J. Sanger, 150. Oxford-street.)

" nutritious farina" consists of potato-flour, artificially coloured of or rosy hue, the colouring matter probably being Rose Pink.

BRADEN'S FARINACEOUS FOOD.

(*Copy of Label on Canister.*)

"FARINACEOUS FOOD
FOR INFANTS
and Persons with Impaired Digestion.
Manufactured by
Alexander Braden,
St. John-street, London.
Warranted.
Highly approved and recommended by the faculty."

Analysis of Braden's Farinaceous Food.

(Purchased of Marshall, 17. Adams-row, Hampstead-road.)

This article consists of wheat-flour baked.

JONES'S PATENT FLOUR.

(*Copied from Wrapper.*)

"By Special Appointment,
Purveyor to Her Majesty in Ordinary.
H. Jones's
PATENT FLOUR,
for Bread, Pastry, Puddings, Cake, &c.,
Blackmore and Brooke,
(Sole Licensees for London and District,)
141 & 142. Old-street, Goswell-street.
Finest Quality 2½*d.* per Pound.

Testimonial.

"Berkeley-square, Bristol, June 2, 1846.

have partaken of various kinds of bread made from the 'Patent Flour,' as red by Mr. Henry Jones, the Patentee; and I have pleasure in giving my nony of its value and importance as an article of wholeome diet adapted to rposes of domestic use, but more especially for the convenience, health, omfort of persons taking long voyages—merchants, captains of ships, and gn countries—by enabling fresh bread to be had under all circumstances, e it would be impossible to procure yeast in a state fit for use.

believe the 'Patent Flour' to be perfectly free from any ingredient which lculated to interfere with the most susceptible state of the digestive organs, that there are many dyspeptic persons who are likely to be benefited by it.

"Henry Hawkes Fox, M.D."

Analysis of Jones's Patent Flour.

(Purchased of J. Bodley & Co., Portman Place, Edgware Road.)

e above preparation consists of wheat-flour, with tartaric acid and onate of soda.

BASTER'S SOOJIE.

(*Copied from Wrapper.*)

Take of the farinaceous food two very full high conical-dipped teaspoons, nix it well in a quarter of a pint of cold milk, or milk-and-water—put another quarter of a pint of milk or milk-and-water on the first to simme stirring the first mixture into this till it thickens only, then sweeten it.

"After it is so done (if you wish to enrich it) add one or more well-beaten eg to this, and again put it on a slow fire, keeping it stirring for a minute onl Care must be taken not to permit it to boil, or it will destroy the Vegetable pr perties of which it is partly composed.

"You must make it as before mentioned; to make it into pudding do not mi it dry as flour. When so done put it into a basin in a saucepan, with wate half-way up it, and the steam will cook it in twenty minutes.

"Use a little of the Carraway Flour inclosed if infants have spasms."

"Of the highest importance to all Mothers.

BASTER'S PRINCE AND PRINCESS'S FARINACEOUS FOOD.

FOR THE SAFETY OF INFANTS FROM THE HOUR OF BIRTH.

"It is suitably prepared for mothers, if used before and after their accouche ment, and called

SOOJIE.

"It is of the highest importance for females verging on maturity, and all persons in sickness, and of the greatest consideration to the aged, and person suffering from extreme debility, especially females who have improperly use the nothingless gelatines made from Isinglass, Arrow-root, &c., till consumptio terminated existence. It relieves Indigestion, Bilious and Costive Habit, and will make a restorative Custard, Light or Plum Pudding, in twelv minutes.

"Mr. Baster continues to make his

Vital Potion,

"The which by consent of the medical attendant is especially compounded f persons in consumption, decline, debility, and otherwise. Also his very important

Compounded Farina,

"That supersedes the dangerous application of oatmeal gruel (by the predominant acid in the oat during medical treatment). It is compounded of several descriptions of grain, germinated and otherwise prepared free of all acidity, as his farinaceous food afore-mentioned, and may be made with water without boiling in three minutes. It will not only serve for infants' food, but it will be found of the greatest consideration for captains of ships, and their passengers, should indisposition prevail whilst on the ocean or in tropical climates.

"*Caution.*—It being so that parents discontinue this food the instant the infant can masticate bread-and-butter, oatmeal, gruel, bread-and-milk, meat, &c., thereby causing an acidity, debility, and other diseases, ending in dissolutio which if continued twice a day onwards to maturity, especially with females, i will produce a healthy system and prevent the fatal consequences too often foun in families. It is a cheaper beverage than common oatmeal for all persons fo supper potion without bread."

Analysis of Soojie.

(Purchased of Aste, 165. Tottenham-court-road.)

Soojie consists of Wheat flour sweetened with Sugar.

BASTER'S COMPOUNDED FARINA.

(*Copied from Wrapper.*)

"To be made with milk or water as approved.

"Take of the enclosed a very full dipped tablespoon, and mix it with water o milk into a thick batter; put half a pint of water or milk on the fire to boil; when so done, stir the batter well into it, and kept it stirring till it thicken then add some salt or sugar as approved. If you would enrich it, add a smal piece of good butter the instant it comes off the fire, and a well-beaten egg; bu if so, return it on the fire for a minute only.

"BASTER'S
PATENT
COMPOUNDED FARINA,
For making with water or otherwise in three minutes, a
nutritious, digestive, and restorative
GRUEL.

is prepared from wheat and other grain, as his Farinaceous Infant's Food, erminating process, thus divested of all acidity, of which the oat or com- atmeal cannot be dispossessed, and producing a rich gelatine; it will be of the highest importance, and the only safe gruel potion for all persons kness and under medical treatment, especially for the safety of females, and after birth, and for invalids, the aged, and the nursery."

Analysis of Baster's Compounded Farina.

(Purchased at 7. Orange-street, Bloomsbury.)

This article consists of Wheat-flour, sweetened with Sugar.

PLUMBE'S IMPROVED FARINACEOUS FOOD.

(*Copied from Wrapper.*)

"PLUMBE'S IMPROVED FARINACEOUS FOOD
For Infants, Invalids, and others,
3. Alie-place, Great Alie-street, Whitechapel.
1*s.* per pound.

trongly recommended by the faculty as a light, nutritious diet, suitable for fast, luncheons, suppers, &c., and may be used for puddings or custards, dinary purposes. Recipes accompany each tin.

'London, 24. Bloomsbury-square, Sept. 5th, 1850.

hereby certify that the Farinaceous Food, for Infants, Invalids, and others, ld by Mrs. Plumbe, of 3. Alie-place, Great Alie-street, Whitechapel, is a ctly pure vegetable product, agreeable to the palate, light on the stomach, of digestion, eminently wholesome and nutritious, and therefore deserving neral patronage and adoption for the dietetic regimen of weakly children convalescents.

'Andrew Ure, M.D., F.R.S.,
'Professor of Chemistry and Analytical Chemist.'

"PLUMBE'S IMPROVED FARINACEOUS FOOD

pure foreign vegetable production; strongly recommended by the faculty ing light and easy of digestion; free from the unpleasant flavour of the as now in general use, but containing equally as much nutriment. Invalids find it a more delicious and restorative food, and mothers an indispensable ct to the nursery. To persons suffering from loss of appetite, this superior will be found invaluable, and by its regular use dyspepsia and all disorders ng from indigestion are entirely eradicated and prevented. It imparts gth and energy to the most enfeebled constitution, invigorating the ular and nervous system, and thereby completely establishing a healthy n of the stomach and bowels, so that the most delicate may partake with ure and benefit.

Sold by
A. S. Plumbe."

Analysis of Plumbe's Improved Farinaceous Food.

(Purchased at 3. Alie-place, Whitechapel.)

is preparation consists principally of Bean or Pea-flour, most probably rmer, with a little Tacca Arrow-root, some Potato-flour, and a very Maranta Arrow-root.

PALMER'S VITAROBORANT.

(*Copy of Label on Wrapper.*)

"VITAROBORANT.
A New and Health-Restoring
Royal
FARINACEOUS FOOD.
Prepared by Palmer & Co.,
1. Montague-terrace, De Beauvoir-sq., Kingsland, London.
Sixpence.
Directions inside the Packet.
None are genuine unless they bear the Royal Arms, and the Signature of
Wm. Palmer & Co."

Analysis of Vitaroborant.

(Purchased at 1. Montague-terrace, De Beauvoir-square, Kingsland).

This article consists of a mixture, sweetened with sugar, of the Red o Arabian Lentil and Wheat-flour, the latter in considerable amount.

"*Vitaroborant*" bears considerable resemblance to Du Barry's Ravelen and is sold at 2*s*. per pound.

The public are now in a position to judge of the degree of relation which exi between the high-sounding titles bestowed on many of the preparations noti in this Report, their actual composition, and the properties, so loudly vaunt alleged to be possessed by them; they will also be able to judge somewhat the extent to which the pocket is made to suffer through their health-restori life-prolonging, easily-digestible articles and compounds.

COCOA, AND ITS ADULTERATIONS.

FURTHER REPORT.

In our previous Report on Cocoa and its Adulterations, we described the str ture of the seeds, quoted the statements of various writers, respecting the s stances employed either to admix with or adulterate cocoa, gave, approximat the percentages of starch and sugar contained in a great variety of propri preparations, and made known the kinds of starch or flour, and the mixtures combinations of these, employed by different makers. In the present arti we publish the results of a further examination of the whole of the samples p viously referred to, a scrutiny undertaken with the view of ascertaining wh any of them contained mineral or earthy colouring matters and ingredients.

It will be recollected that many of the preparations examined were ascertai to contain very large quantities of starch and sugar, and that in some instan these constituted more than half the article. Now, the admixture in la amount of such substances with cocoa, could not but produce an article o much lighter colour than any preparation of genuine cocoa—a difference great, in many cases, as to be calculated to excite suspicions of its genuine It might therefore be surmised, *à priori*, that some manufacturers would h recourse to colouring matter, to conceal the poverty of many of their prep tions, and to impart to them a greater appearance of strength and richness. W will now proceed to determine whether such a surmise be well founded.

It is a well-established fact that all vegetable colours are destroyed by a r heat, and consequently that the ash which remains after the incineration of a coloured vegetable substance is itself free from colour.

On the other hand, it is equally certain that the majority of earthy colouri matters, however much they may be altered and modified by incineration, a rarely altogether destroyed.

In the knowledge of these facts, we have then a ready and most satisfacto means of ascertaining whether any sample of cocoa, or other vegetable substan is either free from, or admixed with, coloured mineral ingredients.

When the ash of cocoa, therefore, is greyish-white or even blackish-whi according to the degree and method of incineration, the sample may be p nounced to be free from coloured earthy substances.

When, however, the ash is distinctly coloured, it is very certain that the coa contains a coloured mineral ingredient.

It must be borne in mind, however, that the absence of colour in the ash is t, in all cases, to be taken as sufficient evidence of its freedom from admix-re with mineral substances, as some of these are themselves colourless, as rbonate and sulphate of lime, and therefore yield a colourless ash. In such ses the weight of the residue should be ascertained. 480 grains of genuine coa furnish an ash which usually weighs about twenty-four grains. When the eight *much exceeds* this, there will be reason to suspect the presence of a lourless earthy substance.

It should be known also that effervescence on the addition of a mineral acid no proof of adulteration with an earthy carbonate, as the ash of genuine cocoa ervesces strongly on being thus treated, in consequence of its containing a nsiderable amount of alkaline and earthy carbonates.

SULTS OF THE FURTHER EXAMINATION OF NUMEROUS SAMPLES OF FLAKE, ROCK, GRANULATED, SOLUBLE, DIETETIC, HOMŒOPATHIC, AND OTHER COCOAS.

In order to become thoroughly acquainted with the appearances and cha-cters of the ash of genuine cocoa, we incinerated a variety of samples of the tire kernels, as well as several samples of cocoa and chocolate prepared and nufactured from these. In every case we obtained a *greyish-white* residue.

FLAKE COCOA.

Sample.—Purchased of J. H. Kemper, 1. Waterloo-terrace, Commercial-road East.

Ash, greyish-white.

d Sample.—Purchased of Owen Sparrow & Co., No. 1. Aldgate.

Ash, of a light brown colour.

d Sample.—Purchased of Messrs. Ridgway & Co., 4 & 5. King William-street City.

Ash, greyish-white.

Sample.—Purchased of J. Lawrence, 51. High-street, Bloomsbury.

Ash, greyish-white.

Sample.—Purchased of Hall, South-row, Golden-square.

Ash, of a yellow colour.

Sample.—Purchased of Stevenson & Co., 55. Strutton-ground, Westminster.

Ash, of a light yellowish-brown colour.

Sample.—Purchased of H. Reeves, 6. Great Chapel-street, Broadway, Westminster.

Ash, of a light brown colour.

Sample—Purchased of Waller & Co., 80. Charlotte-street, Tottenham-court-road.

Ash of a dark fawn colour.

Sample.—Purchased of W. Harper, 24. James-street, Lisson-grove.

Ash, of a fawn colour.

Sample.—Purchased of W. Strugnell, 109. Edgware-road.

Ash, greyish white.

GRANULATED COCOA.

11th Sample.

J. & S. FRY & SONS'
GRANULATED COCOA.
Ash, of a light-brown colour.

12th Sample.

HANDFORD & DAVIES'
PURE
GRANULATED COCOA.
Ash, greyish-white.

BROMA.

13th Sample.
STRICKLAND'S BROMA.
Ash, greyish-white.

14th Sample.
FRY'S BROMA.
Ash, of a bright and rusty-yellow colour.

15th Sample.
STRATTON'S BROMA.
Ash, of a dark-brown colour.

SOLUBLE COCOA.

16th Sample.
DUNN'S SOLUBLE COCOA.
Ash, greyish-white.

17th Sample.
TYLER & ESSEX'S.
BEST SOLUBLE COCOA.
Ash, of a yellowish-brown colour.

18th Sample.
STRATTON'S
IMPROVED SOLUBLE COCOA.
Ash, of a golden-yellow colour.

19th Sample.
GRAHAM & HEDLEY'S
GENUINE SOLUBLE COCOA.
Ash, of a yellowish fawn colour.

20th Sample.
DEPUYTREN'S
CELEBRATED SOLUBLE COCOA.
Ash, of a bright ferruginous-yellow colour.

21st Sample.
STEANE, DAVIS, & Co.'s
SUPERIOR SOUBLE COCOA.
Ash, of a light-brown colour.

22nd Sample.
TAYLOR BROTHERS'
SOLUBLE COCOA.
Ash, of a fawn colour.

23rd Sample.
HAWTHORNE & Co.'s
CELEBRATED SOLUBLE COCOA.
Ash, of a light fawn colour.

24th Sample.
BARRY & Co.'s
SUPERIOR SOLUBLE COCOA.
Ash, of a fawn colour.

Homœopathic Cocoa.

25th Sample.
SPARROW'S
IMPROVED DIETETIC COCOA.
Ash, greyish-white.

26th Sample.
LEATH'S
HOMŒOPATHIC COCOA.
Ash, of a fawn colour.

27th Sample.
HEADLAND'S
HOMŒOPATHIC COCOA.
Ash, greyish-white.

28th Sample.
CADBURY BROTHERS'
HOMŒOPATHIC COCOA.
Ash, of a salmon-red colour.

29th Sample.
GRAHAM & HEDLEY'S
HOMŒOPATHIC COCOA.
Ash, greyish-white.

30th Sample.
J. S. FRY & SONS'
HOMŒOPATHIC COCOA.
Ash, of a fawn colour.

31st Sample.
STEANE, DAVIS, & Co.'s
PREPARED HOMŒOPATHIC COCOA.
Ash, of a brown colour.

32nd Sample.
NICOL & Co.'s
HOMŒOPATHIC COCOA.
Ash, greyish-white.

33rd Sample.
TAYLOR BROTHERS'
HOMŒOPATHIC COCOA.
Ash, greyish-white.

34th Sample.
EPPS' HOMŒOPATHIC COCOA.
Ash, greyish-white.

35th Sample.
BARRY & Co.'s
HOMŒOPATHIC COCOA.
Ash, greyish-white.

36th Sample.
RELFE'S HOMŒOPATHIC COCOA.
Ash, greyish-white.

37th Sample.
TAYLOR BROTHERS'
DIETETIC COCOA.
Ash, greyish-white.

38th Sample.

WHITE'S HOMŒOPATHIC COCOA.

Ash, of a dull yellowish-brown colour.

ROLL COCOA.

39th Sample.

GRAHAM & HEDLEY'S ROLL COCOA.

Ash, greyish-white.

40th Sample.

TAYLOR BROTHERS' ROLL COCOA.

Ash, greyish-white.

ROCK COCOA.

41st Sample.—Purchased of R. H. Feltoe, 298. Oxford-street.
Ash, of a golden-yellow colour.
42nd Sample.—Purchased of Houle & Co., 282. Oxford-street.
Ash, of a yellowish-brown colour.
43rd Sample—Purchased of Holland & Co., 78. Lamb's Conduit-street.
Ash, of a light-brown colour.
44th Sample—Purchased of J. Appleton, 174. Drury-lane.
Ash, greyish-white.
45th Sample—Purchased of G. B. White, 174. Shoreditch.
Ash, of a rusty-yellow colour.
46th Sample—Purchased of William Oakley, 72. High-street, Whitechap
Ash, greyish-white.
47th Sample—Purchased of Rodgers & Co., 97. Crawford-street, Edgware
Ash, of a light-fawn colour.
48th Sample—Purchased of H. Williams, 92. Crawford-street, Bryan square.
Ash, of a light-fawn colour.
49th Sample—Purchased of A. Andrews & Co., 57. Tottenham-court-roa
Ash, of a fawn colour.

SOLUBLE COCOA.

50th Sample.

J. S. FRY & SONS'
CELEBRATED SOLUBLE COCOA.

Ash, of a bright-fawn colour.

51st Sample.

TAYLOR BROTHERS'
CELEBRATED SOLUBLE COCOA.

Ash, of a fawn colour.

52nd Sample.

DUPUYTREN'S
EXHIBITION COCOA.

Ash, of a golden-yellow colour.

53rd Sample.

TYLER & ESSEX'S
BEST SOLUBLE COCOA.

Ash, of a ferruginous-yellow colour.

54th Sample.
J. S. FRY & SONS'
SOLUBLE COCOA.
Ash, of a ferruginous-yellow colour.

Cocoa Paste

55th Sample.
J. S. FRY & SONS'
BEST COCOA PASTE.
Ash, of a light-yellow colour.

56th Sample.
DUNN'S COCOA PASTE.
Ash, greyish-white.

ULTS OF THE FURTHER EXAMINATION OF THE VARIOUS SAMPLES OF CHOCOLATE.

1st Sample.
DUNN'S
GENUINE UNADULTERATED
CHOCOLATE POWDER.
Ash, greyish-white.

2nd Sample.
GATTI & BOLLA'S
GENUINE
FRENCH CHOCOLATE POWDER.
Ash, greyish-white.

3rd Sample.
WHITE'S CHOCOLATE POWDER
Ash, of a deep rusty yellow colour.

4th Sample.
DUNN'S
UNADULTERATED CHOCOLATE.
Ash, greyish-white.

5th Sample.
SPANISH CHOCOLATE.
Ash, greyish-white.

6th Sample.
STRATTON'S PATENT
COMPRESSED TRINIDAD COCOA.
Ash, of a light-brown colour.

7th Sample.
WHITE'S ROYAL NAVY CHOCOLATE.
Ash, of a yellowish-brown colour.

8th Sample.
CAPPER & GREY'S
SUPER SOLUBLE CHOCOLATE.
Ash, greyish-white.

9th Sample.
PEEK BROTHERS & CO.'s
SOLUBLE CHOCOLATE.
Ash, greyish-white.

10th Sample.

TAYLOR BROTHERS'
SOLUBLE CHOCOLATE.
Ash, greyish-white.

11th Sample.

BARRY & Co.'s
SOLUBLE CHOCOLATE.
Ash, greyish-white.

12th Sample.

J. S. FRY & SONS'
SOLUBLE CHOCOLATE.
Ash, of a light-yellow colour.

From an examination of the above Table, it appears,—

1st. That out of the ten samples of *flaked cocoa* which were incinerated, contained earthy colouring matter.

2nd. That one of the two samples of *granulated cocoa* yielded a coloured

3rd. That two of the three *Bromas* contained earthy colouring matter.

4th. That out of fourteen samples of *soluble cocoa*, earthy colouring matt was discovered in thirteen.

5th. That five of the fourteen *homœopathic cocoas* contained coloured earth.

6th. That the two *roll cocoas* were free from earthy colouring matter.

7th. That earthy colouring matter was present in seven of the nine samp of *rock cocoa* examined.

8th. That the ash in one of the two *cocoa pastes* incinerated was coloured

9th. That of the twelve samples of *chocolate* in *powder* and in *cake* examin earthy colouring matter was present in four.

10th. That of sixty-eight samples of cocoa and chocolate submitted to amination, *twenty-nine* were free from admixture with earthy colou matter, while the remaining *thirty-nine* samples all contained colo earthy substances, in greater or less amount.

It appears further,—

That the preparations contained in the packages labelled with the names Handford & Davies, Strickland, Henry Sparrow, W. Headland, Nicol Co., J. Epps, J. Relfe, Gatti & Bolla, Capper & Grey, and Peek Bro & Co., *were entirely free from earthy colouring matter.*

That the packages bearing the names of J. Leath, Hawthorne and Co., Cadbury Brothers, *contained earthy colouring matter.*

That of the samples of three different preparations of cocoa, labelled with names of Graham & Headley, *coloured earthy matter was found in one.*

That *both* of the samples bearing the names of Tyler & Essex *cont* *coloured earthy matter.*

That *earthy colouring matter* was present *in the three packages* labelled J. Stratton & Co.

That the *two* preparations of cocoa to which the name of Baron Dupuy was affixed, *were largely adulterated with red earthy matter.*

That the *two* samples labelled Steane, Davis & Co., *furnished coloured*

That of the *three* packages to which the names of Barry and Co. were *one* yielded a *coloured ash.*

That *the ashes of the whole of the seven preparations of cocoa contained in packages to which the names of J. S. Fry & Sons were attached,* *coloured to a greater or less extent.*

That *two* of the six preparations of cocoa, labelled Taylor Brother, *cont* *earthy colouring matter.*

That the *four* preparations purchased of the manufacturer, G. B. White, *highly coloured.*

Lastly, that *the samples of cocoa, four in number, manufactured by D. D* *and submitted to examination, were ascertained to be entirely free from admixture with coloured earthy matter.*

e have now to make a few observations respecting the substances employed he purpose of colouring cocoa and chocolate.

the several preparations purchased of Mr. G. B. White, in "Cadbury hers' Homœopathic Cocoa," "Stratton's Improved Soluble Cocoa," paytren's Exhibition and Superior Soluble Cocoas," "Fry's Soluble Cocoa," y's Broma," and Tyler & Essex's Best Soluble Cocoa," the colouring matter was unquestionably either red ochre, (which is a compound of oxide of iron silica, and sometimes alumina, or clay,) or some earthy substance analagous in position; this conclusion is based on the following facts and observations:—

he tints presented by several of the above cocoas could be exactly imitated nixing different proportions of red ochre with cocoa. The ashes obtained n the incineration of these mixtures, closely resembled those of the adul- ted samples.

'he chemical composition of these ashes was found to correspond with that of ochre.

n analysis by Dr. Letheby of the ash procured by the incineration of G. B. ite's rock cocoa, gave the following results. It must be borne in mind, how- r, that the salts proper to cocoa are included in this analysis.

Carbonate of Potash - - - -	- 0·05
Phosphate of Potash - - - -	- 0·10
Sulphate of Lime - - - -	- 0·43
Phosphate of Magnesia - - - -	- 0·50
Carbonates of Magnesia and Lime - -	- 0·20
Oxide of Iron and Silica - - -	- 2·23
Unconsumed Carbon - - - -	- 0·06
Silica - - - - - -	- 1·00
Chlorides (Alkaline) - - - -	- 0·20
Water - - - - - -	- 0·23
	5·00

'he above analysis was accompanied with the following remark by Dr. heby:—

The analysis of the red ash proves that the cocoa was largely adulterated oxide of iron and silica, two substances which are found in the common ochre of commerce."

should be known that the colour of the ash obtained by the incineration of parations of cocoa, adulterated with red ochre, is subject to considerable ation, dependent on the manner in which the incineration has been con- ted, whether in an open or covered crucible, and according to the degree to ch the ash has been heated, and the length of time it has been subjected to process. Thus the ash of cocoa so adulterated may be made to assume dif- nt colours, varying from dark brown, light brown, fawn, yellow, ferruginous ow, up to rust-red, according to the method of incineration.

lany of the other preparations of cocoa, not referred to by name, are doubt- coloured with the same substance.

n some of the samples clay and plaster of Paris were detected; it is right, how- r, to mention that in no case were these substances used for the sake of adding or weight to the cocoa, the quantity present being too small; but they no bt entered into the composition of the earthy colouring matters employed.

he whole of the samples of cocoa and chocolate purchased of Mr. G. B. White e remarkable for their high and evidently artificial colour. In a letter which printed in "The Lancet" of June 21, and which will be found at p. 236, White complained that we had used him "hardly fair" in subjecting his mmon" articles only to examination. As our analyses included his "Pure œopathic Cocoa" and "Royal Navy Chocolate," we are tempted to ask, Mr. White class these as amongst his common preparations? In the same r Mr. White professes a willingness to adopt any suggestion which we might e for the improvement of his cocoas. We would simply suggest that for the re he use no red ochre.

OATMEAL, AND ITS ADULTERATIONS.

The subject of this Report may excite some degree of surprise in the mind many, as from the cheapness of the article, it would hardly be supposed sufficient inducement could exist for its sophistication. It appears, howev from the following analyses, that such a supposition is not correct; and that food given to the horse in grain, is not always to be procured in a genuine st by man, in the form of oatmeal.

Results of the Microscopic Examination of Various Samples of O meal Purchased at the Establishments of Different Corn-Chandl and Bakers in the Metropolis.

1st Sample.—Purchased of Armstrong, 31. Chapel-street, Somers-town.
Adulterated—consisting to a very large extent of *barley-meal.*

2nd Sample—Purchased of F. Ambridge, 65. Brewer-street, Somers-town.
Genuine.

3rd Sample—Purchased of J. Brook, 31. Lisson-grove North.
Genuine.

4th Sample.—Purchased of J. Willsher, 35. Grove-place, Lisson-grove.
Adulterated—containing a large proportion of *barley-meal.*

5th Sample.—Purchased of Nettlefold & Co., 33. New Church-street, Pa dington.
Adulterated—containing a considerable quantity of *barley-meal.*

6th Sample.—Purchased of W. Strohm, 11. New Church-street, Paddington
Genuine.

7th Sample.—Purchased of J. Gibbs, 5. New Church-street, Paddington.
Adulterated—containing a large admixture of *barley-meal.*

8th Sample.—Purchased of H. C. Helffenstein, 135. St. Alban's-pla Edgware-road.
Genuine.

9th Sample.—Purchased of H. Waters, 134. St. Alban's-place, Edgware-ro
Genuine.

10th Sample.—Purchased of Z. Pratt, 96. Edgware-road.
Genuine.

11th Sample.—Purchased of J. S. Wall, 132. Edgware-road.
Genuine.

12th Sample.—Purchased of J. Muggeridge, 16. Adams-street West, Po man-square.
Adulterated—containing some *barley-meal.*

13th Sample.—Purchased of M. Staner, 16. Hinde-street, Manchester-squa
Adulterated—containing very much *barley-meal.*

14th Sample.—Purchased of A. Michie, 33½. Edward-street, Portman-squar
Genuine.

15th Sample.—Purchased of M. Schlarb, 61. Marylebone-lane.
Adulterated—largely admixed with *barley-meal.*

16th Sample.—Purchased of W. Schafer, 49. James-street, Oxford-street.
Genuine.

17th Sample.—Purchased of G. Keable, 40. James-street, Oxford-street.
Genuine.

18th Sample.—Purchased of T. Robinson, 19. Barbican.
Adulterated—containing a large proportion of *barley-meal.*

19th Sample.—Purchased of the Free Trade Bread Company, 197. Whitecro street.
Adulterated—containing a considerable quantity of *barley-meal.*

20th Sample.—Purchased of W. Bate, 5. Clare-street, Clare-market.
Adulterated—containing a large proportion of *barley-meal.*

21st Sample.—Purchased of —. Rivere, Charles-street, Drury-lane.
Genuine.

22nd Sample.—Purchased of B. Sahley, 110. Drury-lane.
Adulterated—containing a very large quantity of *barley-meal.*

3rd Sample.—Purchased of W. Edwards, 49. New-cut, Lambeth.
Genuine.

Sample.—Purchased of J. Manning, 42. Lambeth Lower Marsh.
enuine.
Sample.—Purchased of M. Ohler, 14. Lambeth Marsh.
enuine.
h Sample.—Purchased of S. Hudson, 113. High-street, Marylebone.
dulterated—containing a considerable quantity of *barley-meal.*
h Sample.— Purchased of F. Westley, 12. South-street, Manchester-square
dulterated—containing a proportion of *barley-meal.*
th Sample.—Purchased of W. Jobbins, 3. Thayer-street, Manchester-square.
dulterated—containing a large admixture of *barley-meal*, apparently in
much larger proportion than the oatmeal.
th Sample.—Purchased of E. Oram, 5. Davies-street, Berkeley-square.
dulterated—containing a considerable quantity of *barley-meal.*
th Sample.—Purchased of W. Bryan, 34. Gilbert-street, Oxford-street.
dulterated—Admixed to a considerable extent with *barley-meal.*

t appears, from the above analyses, that *Sixteen, or more than one-half of*
Thirty samples submitted to examination, were adulterated by admixture
h large quantities of BARLEY-MEAL. But oatmeal frequently suffers de-
ioration in other ways besides by admixture with barley-flour. One of these
sists in adding to it the investing membranes, &c. of the oat and barley,
hnically termed "rubble," and which are rejected in the preparation of the
er sorts of oatmeal, grits and groats, Scotch and pearl barley.

n referring to the present market prices of oat and barley meals, we find that
ile the first is 16*s.* per cwt., the latter is only 8*s.* per cwt., that is, just one-
f. We thus perceive that the inducement to adulterate oatmeal is very great,
ater, indeed, it appears, than many bakers and cornchandlers can resist.

he following information, furnished us by a correspondent, whose name for
ious reasons we withhold, shows that this article is subject to systematic
lteration. He writes:—

"Since your able analyses have taken place, it has struck me that I may be
e to give you a little information as to an article of food which is adulterated
a most *awful* extent,—viz. *oatmeal.* I will first mention oatmeal *as sent into*
rkhouses, prisons, and *charitable institutions*, which are generally taken at
tract prices. I enclose one for the parish of —— for 1848, where I find the
meal was taken at 14*s.* per cwt. by ——; and by reference to my stock-book,
ind the market price was 17*s.* 6*d.* per cwt.; thus the oatmeal was reduced
6*d.*, and then left an excellent profit. Well, at that time I was trying for
the contracts in London, and could not succeed, my *prices* being generally
out 4*s.* dearer than any one's else: this was a *mystery* to me. By accident I
nd out oatmeal was adulterated with barley-flour which is bought at about
per cwt.; this being mixed with the oatmeal, of course reduced the *price.*
hen, being as wise as my competitors, tried, and have served the above work-
use since.

"Now, the fault lies here. If the workhouses were to take the contracts at a
r-centage on market value, then they would get *good* oatmeal; but they
ays *cut down* the price, and thus get an adulterated article.

"You will see the prices are 14*s.*, 15*s.* 6*d.*, 16*s.*, and 17*s.*; thus if a man wants
be *honest* with them, *they will not let him.* I have again and again wished to
ply at a per-centage on market value; the answer I get is, '*Well, we are*
y well satisfied, and have no complaints.'"

We have ourselves been at some pains to verify the statements made above, and
that purpose have procured samples of oatmeal as supplied to some of our
ons and charitable institutions; these, without exception, we have found on
amination to be largely adulterated with *barley-meal*, as described.

The adulteration of oatmeal is not merely important in a pecuniary, but is of
e consequence in a sanitary point of view.

The properties of oatmeal are thus described in Pereira's Materia Medica:—
Oatmeal is an important and valuable article of food. With the exception of
ize or Indian corn, it is richer in oily or fatty matter than any of the other
tivated cereal grains, and its proportion of protein compounds exceeds that
the finest English wheaten-flour. So that both with respect to its heat-and-
making, and its flesh-and-blood making principles, it holds a high rank."

In the same work we meet with the following account of barley-meal as an article of diet:—"Barley is a valuable nutritive. Considered in relation to wheat, it offers several peculiarities. In the first place it contains much less protein matter; in other words, less of the flesh-and-blood making principle, though Count Rumford considered barley-meal in soup three or four times as nutritious as wheat-flour. Secondly, its starch offers more resistance to the action of the gastric juice, in consequence of its more difficult solubility in water. Thirdly, its husk is slightly acrid, and therefore this should be removed from barley intended for dietetical purposes, as in Scotch and pearl barley. Fourthly, barley-meal is more laxative than wheat-meal."

Contrasting the two, it appears that oatmeal possesses considerable dietetic advantages over barley-meal.

It may be in the recollection of some of our readers, that at the inquest held by Mr. Wakley on the bodies of some of the poor children who fell victims in the pest-house at Tooting, the fact transpired that the oatmeal which formed so considerable a part of their food, was extensively adulterated with barley-meal.

TEA, AND ITS ADULTERATIONS.

Growth and Preparation of Tea.

The tea-plant is a hardy, evergreen, and leafy shrub, which attains the height of from three to six feet, and upwards; it belongs to the natural family Columniferæ (Ternstromiaceæ of Lindley), which includes the Camellias. It is generally propagated from seed, and the plant comes to maturity in from two to three years, yielding, in the course of the season, three, and, in some cases, four crops of leaves.

The first gathering takes place very early in the spring, a second in the beginning of May, a third about the middle of June, and a fourth in August. The leaves of the first gathering are the most valuable, and from these, Pekoe tea, which consists of the young leaf-buds, as well as black teas of the highest quality are prepared. Those of the last gathering are large and old leaves, and, consequently, inferior in flavour and value.

The leaves vary considerably in size and form: the youngest leaves are narrow, convoluted, and downy; those next in age and size have their edges delicately serrated, with the venation scarcely perceptible; in those of medium and large sizes the venation is well marked, a series of characteristic loops being formed along each margin of the leaf, and the serrations are stronger and deeper, and placed at greater intervals.

The principal varieties of black tea are Bohea, which is the commonest and coarsest description, Congou, Souchong, Caper and Padre Souchong, and Pekoe, which are of the highest quality, the last consisting of the very young and unexpanded leaves, and which, when clothed with down, constitute flowery Pekoe.

The principal varieties of green tea are Twankay, Hyson-skin, Young Hyson, Hyson, Imperial, and Gunpowder, which, in green tea, corresponds with flowery Pekoe in black. Imperial, Hyson, and Young Hyson, consist of the second and third gatherings, while the light and inferior leaves, separated from Hyson by a winnowing machine, constitute Hyson-skin, a variety in considerable demand amongst the Americans.

There is, according to most writers, but one species of the tea-plant, from which the whole of the above, and many other varieties of tea, are obtained, the differences depending upon soil, climate, weather, age of the leaves, and mode of preparation.

The plants from which black teas are prepared are grown chiefly on the slopes of hills and ledges of mountains*, while the green tea-shrubs are cultivated in manured soils. Upon this circumstance many of the differences between the two varieties depend.

Other differences are occasioned by the processes adopted in the preparation and roasting of the leaves. Thus, while black tea is first roasted in a shallow iron vessel, called a *kuo*, and secondly in sieves, over a bright charcoal en tea does not undergo the second method of roasting, but only the first that in the *kuo*.

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* There is a range called the Bohea-mountains, from which Bohea tea takes its name.

An important part of the manufacture of tea consists in the *rolling* the leaves, as to impart to them their characteristic twisted shape. This is effected by bjecting the leaves to pressure, and rolling by the hands in a particular anner. The first effect of the application of heat to the leaves in the *kuo*, is render them soft and flaccid; when in this state, they are removed from the sel, and submitted to the first rolling—an operation which, after the renewed ion of the *kuo* on each occasion, is three or four times repeated, with superior s, before the process is considered to be complete.

SCENTING OF TEA.

The following observations on the scenting of tea are extracted from Mr. Ball's Account of the Cultivation and Manufacture of Tea in China:"—

"The Chinese seem universally to agree, in ancient as in modern times, that factitious scent can be given to tea which at all equals its natural fragrance; short, they say, 'that only common tea requires scenting.' Those persons o have had the opportunity of drinking some of the finest kinds of Souchong will perhaps agree with the Chinese in this opinion. There are, however, any scented teas, which, so far from being inferior, are even costly, and much eemed, both in China and in Europe. Of these the *Chu Lan*, or Cowslip yson, may be considered the best.

"The tea about to be scented must be taken hot from the last roasting (which mediately precedes the packing), and poured into a Hyson chest, so as to m a layer of two inches in height from the bottom; a handful or more of the sh flowers (already separated from the stalks) is then strewed over the tea. this manner the tea and flowers are placed in layers, until the chest is quite l. The mouth of the canister is then closed, and thus the tea remains for nty-four hours. The proper proportion is three catties of flowers to one ndred catties of tea. The next day, the chest is emptied, when the tea and wers are mixed together; they then undergo the process of *Poey**, about ee catties being put into one sieve. The *Poey Long* is completely closed, d the tea and flowers are thus roasted about from one to two hours, or rather, til the flowers become crisp. The flowers are then sifted out, and the tea cked. If the tea requires any further scenting, fresh flowers must be used, d the process repeated as before. The tea thus prepared is then mixed with er tea, in the proportion of one part of scented tea to twenty of plain. The ole is then slightly heated in a *kuo* (*chao*), and when packed, constitutes the scription of tea denominated in England Cowslip Hyson. Tea may be nted at any time with this kind of tea, but it must be previously heated or sted about two hours.

"The mode of scenting black tea differs from that of green, and so far as I derstand, there are two or three methods of performing this process. The uchong or Caper teas, the Tet Siong, and other teas of the cowslip flavour, e also scented with the *Chu Lan* flower (*Chloranthus inconspicuus*).

"After gathering, the flowers are separated from the stalks as before, when me people dry them in the sun; but the best mode is to dry them in a Poey g, over a slow fire, taking care not to change the yellow colour of the petals. hen dried they are put aside to cool, and are afterwards reduced to powder. this powder, the scent of which is very powerful, be sprinkled over the leaves viously to the last or two last roastings and rollings, in the process of Poey, e tea will be highly scented; but this is an expensive mode, on account of e additional quantity of flowers required, and therefore is seldom practised. e usual mode is by sprinkling a small quantity of this powder over the tea ing the last process of Poey, which takes place previous to packing. A small ue powder, frequently found in black teas of the caper flavour, cannot have ped the observation of the tea-dealers in England; this powder is that of the Lan flower, whose colour has been changed to white in the process of Poey.

"There is another scented tea, of excellent flavour, which is made in small ntities, and occasionally sent to foreigners as presents. This is a Souchong , scented with the flower of the Pac Sheem (*Gardenia florida*).

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* The roasting of the leaves in a sieve over a charcoal fire.

"There are two other scented teas, also of fine flavour, both Souchong teas, the one scented with the Quy-fa, or Kuey-hoa (*Olea fragrans*), and the other with the Moo-Ly-Hoa (*Jasminum Sambac*). Some people say that these three last teas are mixed with the flowers, as the Hyson tea is mixed with the Chu Lan, and are scented in the same manner. But others say that two sieves are placed in the Poey Long, the lower one containing the flowers, and the upper one the tea. The latter is the mode in which the Pac Sheem tea, to which I have previously alluded, is scented. These are all the flowers with which I am acquainted, which are employed to scent tea; but in the Keun Fang Pu, and Quang Tong Chy (or Canton Geographical History), many others are enumerated as eligible for that purpose. These works also observe that flowers so used should be full blown."

M'Culloch, in his "Commercial Dictionary," draws an interesting parallel between the vine and the tea-plant: —

"Considered as an object of agricultural produce, the tea-plant bears a close resemblance to the vine. In the husbandry of China, it may be said to take the same place which the vine occupies in the southern countries of Europe. Like the latter, its growth is chiefly confined to hilly tracts, not suited to the growth of corn. The soils capable of producing the finest kinds are within given districts, limited and partial. Skill and care, both in husbandry and preparation, are quite as necessary to the production of good tea as to that of good wine.

"The best wine is produced only in particular latitudes, as is the best tea, although perhaps the latter is not restricted to an equal degree. Only the most civilised nations of Europe have as yet succeeded in producing good wines, which is also the case in the East with tea; for the agricultural and manufacturing skill and industry of the Chinese are there unquestionably pre-eminent. These circumstances deserve to be attended to in estimating the difficulties which must be encountered in any attempt to propagate the tea-plant in colonial and other possessions. These difficulties are obviously very great, and perhaps all but insuperable. Most of the attempts hitherto made to raise it in foreign countries were not indeed of a sort from which much was to be expected. Within the last few years, however, considerable efforts have been made by the Dutch government of Java to produce tea on the hills of that island; and having the assistance of Chinese cultivators from Fokien, who form a considerable part of the emigrants to Java, a degree of success has attended them beyond what might have been expected in so warm a climate. The Brazilians have made similar efforts, having also, with the assistance of Chinese labourers, attempted to propagate the tea-shrub near Rio de Janeiro, and a small quantity of tolerably good tea has been produced; but owing to the high price of labour in America, and the quantity required in the cultivation and manipulation of tea, there is no probability, even were the soil suitable to the plant, that its culture can be profitably carried on in that country. It may, perhaps, succeed in Assam, where its culture is now being attempted; for labour is there comparatively cheap, and the hilly and table lands are said to bear a close resemblance to those of the tea districts of China; but we are not sanguine in our expectations as to the result."

"All the black teas," says M'Culloch, "exported (with the exception of a part of the Bohea grown in Woping, a district of Canton) are grown in Fokien, a hilly, maritime, populous, and industrious province, bordering to the north-east on Canton. Owing to the peculiar nature of the Chinese laws as to inheritance, and probably, also, in some degree, to the despotic genius of the government, landed property is much subdivided throughout the empire; so that tea is generally grown in gardens or plantations of no great extent. The leaves are picked by the cultivator's family, and immediately conveyed to market, where a class of persons, who make it their particular business, purchase and collect them in quantities, and manufacture them in part; that is, ex them to be dried under a shed. A second class of persons, commonly known as the Canton market as the 'tea-merchants,' repair to the districts where the tea is produced, and purchase it in its half-prepared state, from the first class, and complete the manufacture by garbling the different qualities; in which operation, women and children are chiefly employed. A final drying is then given, and the packed in chests, and divided according to quality in parcels of from 100 to 0 chests each. These parcels are stamped with the name of the district, wer, or manufacturer, exactly as is practised with the wines of Bordeaux and urgundy, the indigo of Bengal, and many other commodities; and from this rcumstance get the name of *chops*, the Chinese term for a seal or signet.

"The greater part of the tea is brought to Canton by land carriage, or inland avigation, but chiefly by the first: it is conveyed by porters; the roads of hina, in the southern provinces, not generally admitting of wheel carriages, d beasts of burden being very rare. A small quantity of black tea is brought sea, but probably smuggled; for this cheaper mode of transportation is dis- uraged by government, which it deprives of the transit duties levied on inland rriage. The length of land-carriage from the principal districts where the een teas are grown, to Canton, is probably not less than 700 miles; nor that the black tea, over a mountainous country, less than 200 miles. The tea erchants begin to arrive in Canton about the middle of October, and the busy ason continues until the beginning of March, being briskest in November, cember, and January."

There is another particular to which the comparison between the vine and a-plant, made by Mr. M'Culloch, may be extended, namely, the not less neral use of the infusion made from the leaves of the tea-plant by the people various nations of both the old and new worlds.

In China, as appears from the following extract, tea is the common beverage the people. The late Sir George Staunton informs us "that tea, like beer in gland, is sold in public-houses in every town, and along public roads, and banks of rivers and canals, nor is it unusual for the burdened and weary aveller to lay down his load, refresh himself with a cup of warm tea, and then rsue his journey."*

"The wealthy Chinese simply infuse the leaves in an elegant porcelain cup, hich has a cover of the same material; the leaves sink to the bottom of the p, and generally remain there without inconvenience, though occasionally me may float or rise to the surface. To prevent this inconvenience, sometimes thin piece of silver, of filagree, or open work, is placed immediately on them. here economy is necessary to be studied, the teapot is used. The wealthy panese continue the ancient mode of grinding the leaves to powder; and after fusion in a cup, 'it is whipped with a split bamboo, or denticulated instru- ent, till it creams, when they drink both the infusion and powder, as coffee is d in many parts of Asia.'"†

ANALYSIS OF TEA.

The infusion made from tea contains gum, glucose or saccharine matter, a ge quantity of tannin, and a peculiar nitrogenised principle called *theine*; this is ntical with *caffein*, and upon its presence many of the properties of tea depend.

The amounts of gum and tannin contained in a given sample of tea afford a by which its quality may, to some extent, be determined.

The per-centage of these substances may be obtained in the following manner: One hundred grains of tea, dried by means of a water-bath, are to be boiled some time in about a quart of distilled water; this dissolves out the gum and nin, but does not affect the lignin, which, re-dried in the same way at a perature of 212° Fahr., and weighed, gives the amount of that substance ent in the hundred grains, and shows, by the loss of weight, the combined ntities of the gum and tannin. The decoction is now to be evaporated, and residuum treated with alcohol; this will take up the tannin and colouring tter, but leave the gum, the weight of which being ascertained, after drying, es the per-centage of tannin.

uld it be desired to estimate the quantity of tannin separately, this may be d either by evaporating the alcoholic solution and drying the residue in dinary way, or else by the precipitation of the tannin from the decoction, olution of gelatine. The precipitate being washed and dried at a steam indicates the quantity of tannin, 100 grains of the precipitate being equal grains of tannin.

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* Lord Macartney's Embassy to Pekin, vol. ii. p. 96.

† Ball on the Cultivation and Manufacture of Tea, p. 15.

The determination of the amount of nitrogen in any tea should form part of a rigid analysis; for this purpose, 100 grains, dried in a water-bath until it ceases to lose weight, is to be incinerated with soda-lime, and its contents in nitrogen then ascertained.

While the average amount of nitrogen in tea exceeds five per cent., that in sloe, hawthorn, and elder leaves but seldom exceeds three per cent., and in the first two is nearly always much under this.

The following are the methods of proceeding adopted by different chemists for obtaining the active principle of tea, theine, and for estimating its amount:—

Mulder obtains it from tea by heating the evaporated extract by hot water, with calcined magnesia, filtering the mixture, evaporating to dryness the liquor which passes through, and digesting the residuum with ether. This solution being distilled, the ether of course passes over, and the theine remains. This principle may be extracted in the same way from raw ground coffee.

Dr. Stenhouse obtains theine by adding acetate of lead to a decoction of tea, evaporating the filtered liquid to a dry extract, and exposing this extract to a subliming heat in a shallow iron pan, whose mouth is covered flatly with porous paper, luted round the edges as a filter to the vapour, and surmounted with a cap of compact paper as the receiver. According to this method, Dr. Stenhouse obtained only 1·37 per cent. of theine.

M. Peligot, remembering that the quantity of nitrogen contained in tea leaves frequently amounted to 6 per cent., was hence led to believe that much more theine existed in them than had hitherto been separated, and he adopted the following improved method of extraction:—

To the hot infusion of tea, subacetate of lead and then ammonia were added; the liquid was filtered, and the lead separated by means of sulphuretted hydrogen; after a second filtration, the clear liquid being evaporated at a gentle heat, afforded, on cooling, an abundant crop of crystals. By re-evaporation of the mother liquid more crystals were procured, amounting altogether to from 5 to 6 per cent.

According to Mulder's analyses, 100 parts of tea consist of—

	Green.	Black.
Essential oil (to which the flavour is due) - -	0·79	0·60
Chlorophyle - - - - -	2·22	1·84
Wax - - - - -	0·28	—
Resin - - - - -	2·22	3·64
Gum - - - -	8·56	7·28
Tannin - - - - -	17·80	12·88
Theine - - - - -	0·43	0·46
Extractive - - - - -	22·30	19·88
Do., dark-coloured - - -	—	1·48
Colourable matter, separable by hydrochloric acid -	23·60	19·12
Albumen - - - - -	3·00	2·80
Vegetable fibre - - - -	17·08	28·32
Ash - - - - -	5·56	5·24
	100·0	100·0

The theine is obviously much underrated in the above analyses.

Theine, when pure, crystallises in fine glossy needles, like white silk; the crystals lose, at 212°, 8 per cent. of their weight, or two atoms of water of crystallisation; they are bitter; they melt at 350° F., and sublime at 543° without decomposing; dried at 350°, they dissolve in 98 parts of cold water, 97 of alcohol, and 194 parts of ether. Theine is a feeble base, and is precipitable by tannin alone from its solutions.

PROPERTIES OF TEA.

Lo-Yu, a learned Chinese, who lived in the dynasty of Tang, A.D. 618 to 906, gives the following agreeable account of the qualities and effects of the infusion of the leaves of the tea-plant:—

"It tempers the spirits, and harmonises the mind; dispels lassitude, and relieves fatigue; awakens thought, and prevents drowsiness; lightens or refreshes the body, and clears the perceptive faculties."

In Pereira's "Materia Medica" we find the following remarks relating to the perties of tea:—"Its astringency is proved by its chemical properties. other quality possessed, especially by green tea, is that of diminishing the dency to sleep. Tea appears to possess a sedative influence with regard to vascular system. Strong green tea, taken in large quantities, is capable, me constitutions, of producing most distressing feelings, and of operating a narcotic."*

THE ADULTERATION OF TEA.

A very considerable amount of skill and ingenuity are displayed, as we shall after perceive, both at home and abroad, in the adulteration of tea, as well in the manufacture of spurious articles in imitation of it. The devices reted to by the Chinese in the preparation of many descriptions of tea, arise of the high prices which several of these command, while the enormous duty acted by the legislature on all descriptions of tea imported into this country, rates as a strong inducement to adulteration after its arrival in this country.

We propose to treat first of BLACK TEA and its adulterations.

The chief adulterations to which black tea is subject consist in the use of ves other than those of tea, in the re-preparation of exhausted tea-leaves, and the employment of substances, either for the purpose of imparting colour and ringency to the infusion of the leaves, or to glaze and face the surface of the d leaves, so that they present an improved appearance to the eye.

On the Use and Detection of Leaves other than those of the Tea-plant.

It has been stated that the Chinese not unfrequently make use of the leaves of r plants besides those of tea, and in particular the leaves of *Camellia sasan-* and *Chloranthus inconspicuus.*

Dr. Dickson† writes,—"The Chinese annually dry many millions of pounds the leaves of different plants to mingle with the genuine, as those of the ash, m, &c.; so that all spurious leaves found in parcels of bad tea, must not be posed to be introduced into them by dealers in this country. While the tea-de was entirely in the hands of the East India Company, few of these adulted teas were shipped for this country, as experienced and competent inctors were kept at Canton to prevent the exportation of such in the Comy's ships; but since the trade has been opened, all kinds find a ready outlet; as the demand often exceeds the supply, a manufactured article is furnished the rival crews."

It has been repeatedly ascertained that the leaves of various British plants are times used in this country in the adulteration of tea.

The leaves of the following species have been detected from time to time in ples of tea of British fabrication:—beech, elm, horse-chesnut, plane, basd plane, fancy oak, willow, poplar, hawthorn, and sloe.

The leaves are dried, broken into small pieces, and usually mixed up with a e made of gum and catechu; afterwards they are ground and reduced to a wder, which, when coloured with rose-pink, is mixed either with the dust of ine tea, or with inferior descriptions of black tea.

fore the observer is in a position to detect the presence of foreign leaves in it is necessary that he thoroughly acquaint himself with the characters of the nd other leaves used to mix with tea, in the various stages of their growth; he must note well the size and form of the leaves, the condition of the , but especially the arrangement and distribution of the bundles of woody and vessels of the leaves—*veins*, as they are commonly termed.

these particulars are well exhibited in the following engravings, by the which the observer will be able to distinguish, not merely the leaves of the different plants resorted to, when entire, but very frequently even roken into fragments.

by the microscope it is indeed in many cases possible to do much more is, and to ascertain, by observing the size and form of the epidermic and

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ome interesting observations on Tea, see Dr. Sigmond's works on Tea, its Effects, Medicinal and

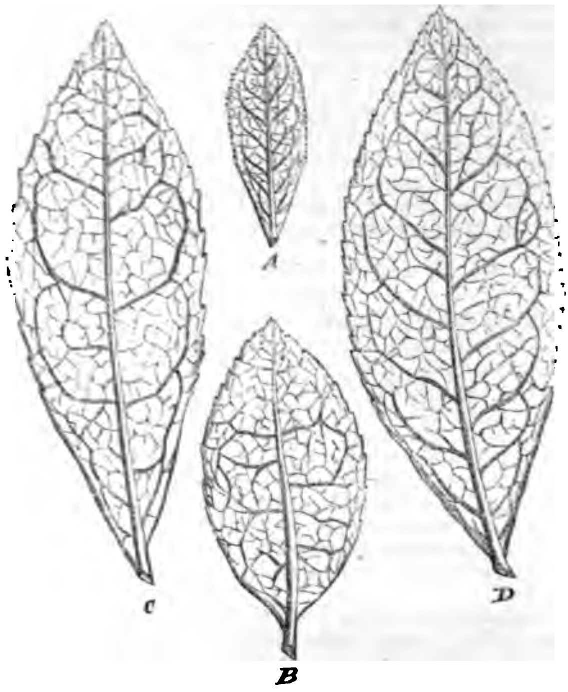
le "Tea" in Penny Cyclopædia.

chlorophylle cells, the stomata, and other particulars, the species to whic of the leaves belong, even when these are ground and reduced to powder is an important fact, not only as it relates to the adulteration of tea, many other articles.

We shall hereafter produce conclusive evidence of the value of the mic in determining differences of structure in the leaves of many plants.

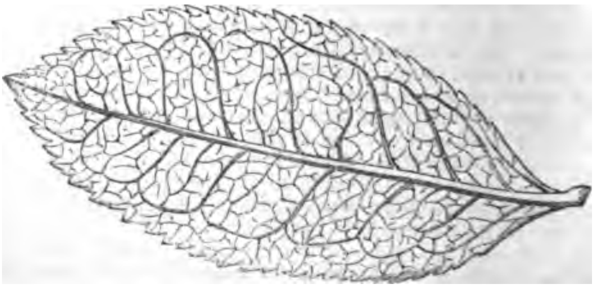
Chemists have endeavoured to discriminate the leaves of one plant fro of another by the manner in which their infusions have been affected addition of re-agents. This method is difficult in its application, and, in g not satisfactory in its results.

Fig. 87.



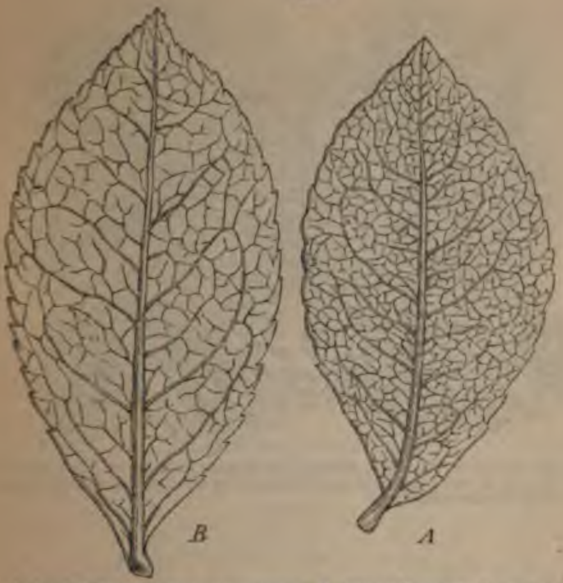
LEAVES OF THE TEA-PLANT.
A, Young leaf; *B*, leaf of black tea of medium size; *C*, ditto of larger growth; *D*, leaf of the green variety of the tea-plant.

Fig. 88.



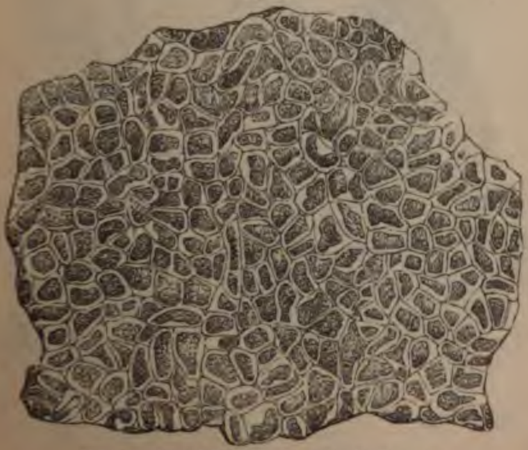
Leaf of the *Assam* variety of the TEA-PLANT; the venation is the same as in the black and green varieties, but there is a slight difference in the serrations, which are alternately large and small — a difference which is probably not constant.

Fig. 89.



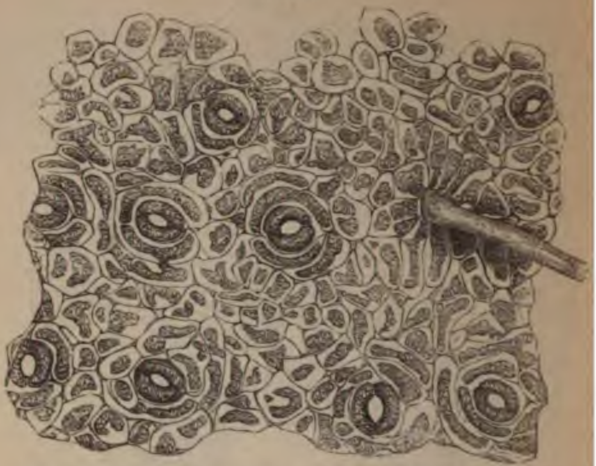
A, Leaf of CHLORANTHUS INCONSPICUUS; *B*, ditto of CAMELLIA SASANQUA; leaves used to adulterate tea.

Fig. 90.



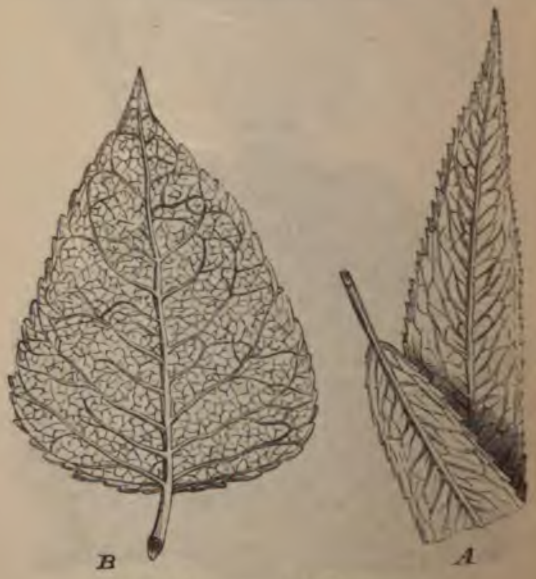
Upper surface of TEA-LEAF, showing its structure. Magnified 350 diameters.

Fig. 91.



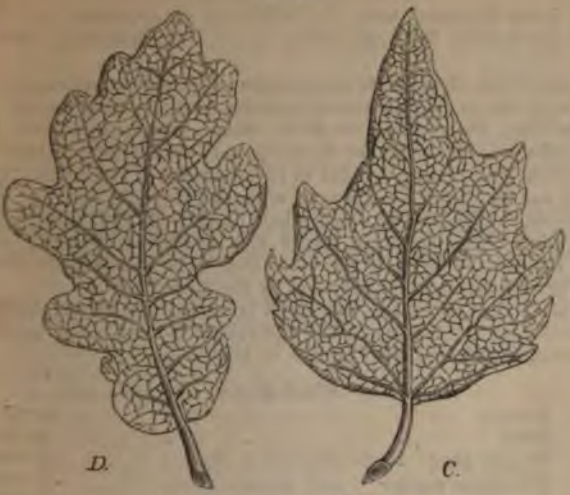
Under surface of TEA-LEAF, showing the stomata and cells of this portion of the leaf, as well as a part of one of the hairs by which this surface is clothed. Magnified 350 diameters.

Fig. 92.



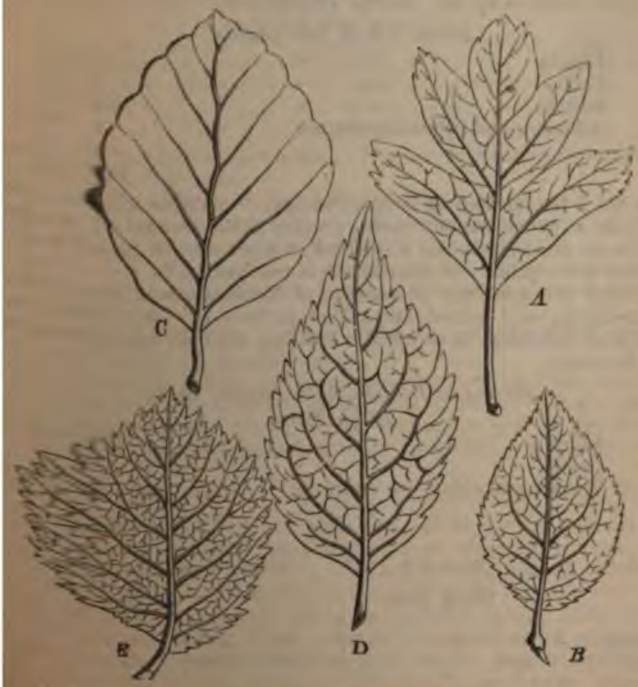
A, Leaf of WILLOW; *B*, ditto of POPLAR.

Fig. 93.



C, Leaf of **Plane**; *D*, ditto of **Oak**.

Fig. 94.



A, Leaf of the **Hawthorn**; *B*, ditto of the **Sloe, or Wild Plum**; *C*, ditto of the **Beech**; *D*, ditto of the **Elder**; *E*, ditto of the **Elm**.

⁂ The whole of the leaves, except that of the camellia, are figured on their under surfaces. The elm, plane, and oak leaves, from which the sketches were prepared, were of small size.

ON EXHAUSTED TEA-LEAVES.

We have been favoured with the following observations, by Mr. G Phillips, of the Inland Revenue Office, on the employment of exhausted leaves : —

" In the year 1843, there were many cases of re-dried tea-leaves, which prosecuted with vigour by this board, and the result was, so far as we coul certain at the time, the suppression of the trade. It was supposed, in 1843 there were eight manufactories for the purpose of re-drying exhausted tea-l in London alone, and several besides in various parts of the country. The tice pursued was as follows : — Persons were employed to buy up the exha leaves at hotels, coffee-houses, and other places, at 2½*d.* and 3*d.* per p These were taken to the factories, mixed with a solution of gum, and re- After this, the dried leaves, if for black tea, were mixed with rose-pinl black-lead, to face them, as it is termed by the trade."

The best method of detecting this fraud is by chemical analysis.

The following are the results of the analysis of *unused* black tea obtain Frank (Gmelin, Handbuch der Chemie, ii. 1252): —

Black Tea.

Tannin	40·6
Gum	6·3
Woody fibre	44·8
Glutinous matter	6·3
Volatile matter and loss	2·0
	100·0

The analysis below is by Mr. George Phillips : —

Black Tea of fair quality.

Lignin	46·8
Gum	5·9
Tannin	42·5
Albumen and colouring matter	4·8
	100·0

Genuine black tea, according to Mr. Phillips, " contains about the sam portion of gum as green tea, but varies greatly in the amount of tannin an nin. Thus some good black teas will afford 45·0 per cent. of tannin ; while of an inferior description will not contain more than 30."

The annexed are analyses of samples of black tea manufactured fro *hausted* tea-leaves, and seized at various periods by the excise autho They have been furnished to us by Mr. Phillips, with the sanction of the I of Inland Revenue.

Seized in London, 24th August, 1843.

Black Tea.

Lignin	78·6
Gum	15·5
Tannin and colouring matter	5·9
	100·0

	Seized in London, March 2. 1843. *Black Tea.*		*Seized in London, Feb.* 15. 18 *Black Tea.*	
	No. 1.	No. 2.	No. 3.	No. 4.
Lignin	81·3	72·9	80·1	78·1
Gum	18·0	19·9	15·5	20·5
Tannin & colouring matter	0·7	7·2	4·4	1·4
	100·0	100·0	100·0	100·0

Seized May 15. 1843.

Black Tea.

	A.	*B.*
Lignin	72·0	84·9
Gum	10·0	11·6
Tannin and colouring matter	16·9	1·0
Carbonate of lime and vegetable red dye	1·1	2·5
	100·0	100·0

ese samples were bloomed with a colour composed of a vegetable red, d with carbonate of lime. *A* was mixed with 37 per cent. of *B*, and *B* was osed of re-dried tea-leaves, that had been exhausted, and made up with

Seized May 15. 1843.

Black Tea.

Tannin	91·1
Gum	7·2
Tannin and colouring matter	1·7
	100·0

Seized June 20. 1843.

Black Tea.

Lignin	84·8
Gum	15·2

is sample consisted of exhausted black tea-leaves *mixed with a few green,* ied and adulterated with gum.

Black Tea seized.

	No. 1.	No. 2.
Lignin	86·7	92·8
Gum	13·3	7·2
	100·0	100·0

ese leaves contained no tannin. They were *completely* exhausted black es, adulterated with gum.

ontrasting the analyses of the exhausted and adulterated tea-leaves with e of genuine tea, it is seen that while the amount of tannin in the former is much reduced, the quantity of lignin and also of gum, where this substance been employed, as it generally is, to make up the leaves, is greatly increased. s, by chemical analysis, this fraud may be detected in the most satisfactory decisive manner.

he methods by which the amount of tannin and gum in tea may be deter- ed, have already been pointed out.

here is reason to believe that the manufacture of spurious tea, both black green, from exhausted tea-leaves, prevails extensively at the present time; we trust that one good result of our disclosures will be the detection and ishment of parties engaged in a practice so wicked and fraudulent.

On Catechu, Terra Japonica, or Japan Earth, in Tea.

his substance, which consists principally of tannin, is sometimes had re- se to when exhausted tea-leaves are used, or when other leaves than those a are employed.

imparts increased astringency and colour to the infusion made from such es, and supplies the place of the tannin which has been abstracted from the usted tea-leaves, and of which some of the other leaves used are deficient. he leaves of the sloe are astringent, and contain a considerable quantity of in; it is on this account they are so frequently employed.

LA VENO BENO.

n article which may be noticed in this place is now very commonly sold, r the above attractive title, to mix with tea.

The nature and alleged virtues of *La Veno Beno* are thus set forth in th handbill given below.

"GREAT ECONOMY TO TEA DRINKERS.
LA VENO BENO.
THE CHINESE TEA IMPROVER,

Is the essential part of the Leaf of a Tree, which grows in the East, and imported through the East Indies to this country.

"The virtues of the Leaf were discovered in the year 1842, and now intr duced to the British Public; the discoverer first having proved the great util and efficacy, by Testimonials from numerous personages of distinction a science.

"The Natives of the East eat or masticate it, keeping it in the mouth till it di solves, esteeming it for its strengthening properties.

"It is four times the strength of the strongest Teas, its flavour equally de cate, its properties more healthful, proved by Physicians and Chemists of hi standing. (*See Testimonials.*)

"It is very strengthening to the nerves.—It does not prevent sleep.—It is u ful on retiring to rest.—It is recommended to the debilitated for its pleasant a invigorating qualities, to the aged for its strengthening properties, and to t public generally for its economy and excellence.

"It will strengthen the Voice.—It is useful to Singers and Public Speaker

"A Threepenny Packet will make One Quarter of a Pound of Tea last as lo as a Half-Pound.

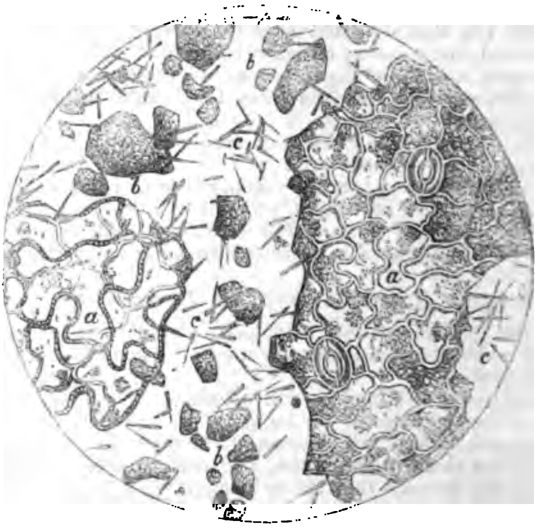
One shilling Packet contains 4½ Threepenny Packets.
NO LICENCE REQUIRED.
SOLD IN PACKETS, AT 3*d.*, AND 1*s.*, EACH.
THOMAS LEITCH, Wholesale Dealer."

The directions for use are as follows:—

"Put a quarter of a teaspoonful into the tea-pot, with two teaspoonfuls of te and it will doubly increase the strength, and improve the flavour."

La Veno Beno consists of a coarse powder, of a reddish-brown colour, inte mixed with small fragments of a leaf which is stated to be that of *sumach*; t the taste the powder is astringent and bitter, and on analysis it is ascertained t be composed in great part of coarsely-powdered *catechu*.

Fig. 95



LA VENO BENO.
a a. fragments of the *Sumach leaves*; *b b*, particles of gum *catechu*, *c c*. *crystals* usually present in catechu. Magnified 350 diameters.

According to Dr. Normandy, the leaves are broken tea-leaves, but this statement is clearly erroneous, as shown by the circumstance that the leaves in question exhibit a structure under the microscope totally different from those of the tea-plant. "But by whatever name called," writes Dr. Normandy, "La Beno Veno is neither plant nor leaf, but simply a mixture of a very small portion of tea-powder (broken tea-leaves) with an excessively large quantity (upwards of 90 per cent.) of pulverized catechu."

On stating to Mr. Phillips that the broken leaves in this article were not those of tea, that gentleman furnished us with the following analysis: —

Sumach leaves - -	24·0
Catechu - - -	76·0
	100·0

Now catechu consists principally of tannin, which, from its astringent action, would be extremely apt, when taken in the quantity in which it exists in *La Veno Beno*, to produce constipation, with the manifold evils which result from such a condition.

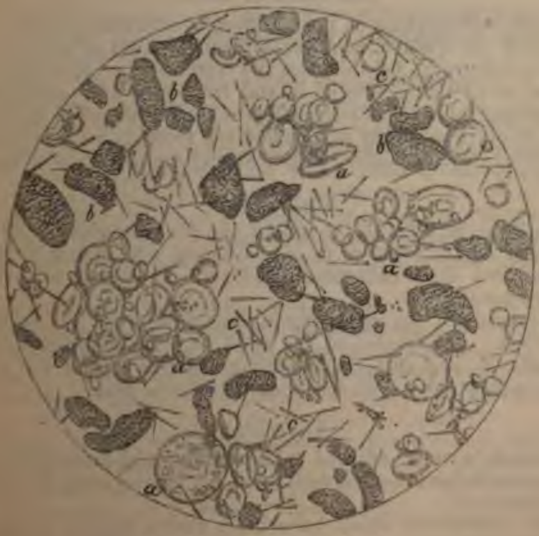
It is therefore evident that, on sanitary grounds alone, *La Veno Beno* is condemned, for in place of being a safe and pleasant drink, it is a potent medicine.

Now although we do not believe that very much of this article is sold, or that it interferes to any serious extent with the consumption of tea, yet seeing that it is recommended to be mixed with tea, and to be employed as a substitute for it, it appears to us that it falls under the operation of the Excise laws, and that the authorities would deserve well of the public if they were to cause proceedings to be taken, whereby the sale of this deleterious compound might be effectually stayed.

"CHINESE BOTANICAL POWDER, or CHINESE ECONOMIST."

This preparation appears to be got up in imitation of *La Veno Beno*, and is sold for the same purpose as that article — viz., to mix with tea.

Fig. 96.



THE CHINESE BOTANICAL POWDER.
a a, starch corpuscles of *wheat*; b b, fragments of *catechu*; c c, *crystals*.
Magnified 350 diameters of same.

It is stated on the wrapper of the packages that it is

"USED in EASTERN CLIMATES for IMPROVING in STRENGTH and FLAVOUR EVERY DESCRIPTION of TEA."

The directions for use are—

"Take half a teaspoonful of the powder to two teaspoonfuls of tea, and it will produce a strength equal to four teaspoonfuls of tea."

Like *La Veno Beno*, it is put up in packages, and sold at the same price; it consists of a coarse powder, of a reddish-brown colour and astringent taste, and is made up of *a mixture of catechu and wheat-flour*, the latter ingredient being added to reduce the strength of the catechu.

Its use is open to the same objections, sanitary and others, as *La Veno Beno*.

GUM AND STARCH.

The great difficulty experienced in the re-preparation of exhausted tea-leaves, is to cause them to resume the twisted form imparted by the Chinese method of rolling and drying the leaves.

For this purpose the leaves are steeped in a strong solution of gum; this, in drying, occasions the contraction of the leaves, and causes them to assume, to a certain extent only, their original appearance; the solution at the same time imparts a polished surface to the leaves. The forms of the greater number of the leaves, even after this preparation, are still very different to those of tea as originally prepared; the leaves are more broken, and agglutinated into small flattened or rounded masses. This circumstance, and the shining appearance of the leaves, are sufficient to enable the experienced eye to detect samples of tea manufactured from exhausted leaves, even when mixed with a proportion of unused tea.

While gum is chiefly employed in this country, the Chinese sometimes make use of a solution of rice-starch to impart a particular form to the leaves, as well as for another purpose to be noticed hereafter.

It is not black tea only which is manufactured from exhausted tea-leaves, but also green tea, the leaves undergoing the same preparatory process of gumming and drying; and although, in the case of green tea, the difficulty of detection, apart from chemical analysis, is increased, yet the accurate observation of the form of the leaves is, in many cases, sufficient for the discovery even of this fraud.

SULPHATE OF IRON.

When a solution of sulphate of iron is brought into contact with a solution of tannin, or one of tea (which contains a large amount of tannin), the liquid becomes deeply coloured. Of this fact the fabricators of spurious tea are well aware; for they avail themselves of it, and frequently add to the gum-water to be used in making up exhausted tea-leaves, a proportion of sulphate of iron. We have now in our possession samples of tea recently manufactured from exhausted tea-leaves, with a solution of gum-water and sulphate of iron.

ROSE-PINK.

As will have been perceived from one of the analyses given, this substance is occasionally used by adulterators to give a colour and bloom to the surface of black tea fabricated from exhausted tea-leaves; it is not, however, very frequently had recourse to.

Rose pink consists of the colouring matter of logwood in combination with carbonate of lime. An infusion of the wood is first prepared, through which the lime is diffused, and this, in subsiding, carries with it the characteristic colour, which, incorporated with the lime, forms rose pink.

LOGWOOD.

In Dr. Normandy's work, entitled "The Commercial Handbook of Chemical Analysis," are the following observations on the employment of logwood in the adulteration of tea:—

"Besides the substances which have been named before, black tea is also mixed sometimes with pulverised extract of logwood. This is immediately *detected* by moistening a small portion of the tea-leaves of the sample with

r, and rubbing it gently about upon a sheet of white paper, which, in that
will be stained bluish-black; moreover, if a portion of the tea, being
n in cold water, imparts immediately to the liquid a pinkish or purplish
r, which is rendered red by the addition of a few drops of sulphuric acid,
sign of the presence of logwood; for genuine black tea produces only
time a golden brown liquor, which is not reddened by sulphuric acid.
ddition of logwood to black tea is for the purpose of simulating strength
high colour of the infusion, something like the addition of chicory to
I have met with this kind of adulteration in teas represented as Souchong
ekoe."

GRAPHITE, PLUMBAGO, OR BLACK LEAD.

generally supposed that the use by the Chinese of colouring matters and
substances for imparting brilliancy of surface and hue, is confined to green
we shall, however, hereafter produce evidence to show that several of the
teas also, as imported into this country, are adulterated, or faced, as it is
d.

of the substances resorted to for this purpose is plumbago, which consists
bon and iron, usually in the proportion of ninety-five per cent. of the
r to five of the latter.

mbago gives to the surface of the leaves a black, shining, and metallic or
appearance, so characteristic, that when once seen, it may be again
y recognised. Apart from the evidence of the presence of this substance
ed by the eye alone, it may be detected in other ways.

thin slice be removed from the surface of one of the leaves faced with
bstance, and placed under the microscope, it will be seen to be thickly
d with numerous minute black particles.

in, if one or two teaspoonfuls of such tea be infused in boiling water, the
after a time, will, in many cases, where the quantity of facing is con-
ble, acquire a blackish hue, and on evaporation, the bottom of the vessel
ning it will be found to exhibit the dark, shining, and characteristic coat-
black lead.

TALC, CHINA CLAY, AND SOAP-STONE.

ious statements have been made as to the use of powdered talc by the
se, but we are not aware that up to this time it has actually been detected
sample of tea.

quite certain, however, that either this or some analogous substances, as
tone and *China clay*, are employed for the purpose of imparting a bloom
re to the surface of the leaves.

evidence of the use of either mica or soap-stone, even in some of their
teas, as will presently appear, is conclusive.

examining closely with the eye the surface of the leaves of certain descrip-
f black tea, minute fragments, shining with a silvery lustre, could plainly
erned. On placing these under an achromatic microscope they all re-
l light, and appeared more or less irridescent — an effect which became
more strongly marked on the application of the polariscope.

presence of fragments of these substances, sufficiently large to be visible
naked eye, is explained by the difficulty experienced in reducing them to
r.

rder to detect the larger particles it is necessary that the leaves should be
led in hot water, redried, and the surfaces then attentively examined. A
lens will be found to afford assistance in the examination.

c, or *mica*, is met with in plates, which possess a laminated structure, the
e refracting the light, and exhibiting a considerable amount of irridescence.
sists of silicate of alumina, with ter-silicate of potassa.

na clay, or *Kaolin*, is prepared from decaying granite, being the result of
composition of the felspar and mica of that mineral; it therefore consists
ge extent, of mica, and, of course, possesses many of the same characters.
par is composed of single equivalents of the neutral silicates of potash
umina.

tite, or *soap-stone*, is a silicate of magnesia, and, like mica, is laminated
idescent, the lamellæ exhibiting a crystalline structure.

Indigo.

Indigo is a vegetable substance obtained from several species of plants of the genus *Indigofera*, especially *I. tinctoria*. It does not exist ready formed in the plant, but is deposited from the juice, as a feculent matter, during fermentation. Its colour, like that of all vegetables, is destroyed by chlorine.

Under the microscope it appears as minute granules and irregular fragments, many of which reflect a blue or greenish colour, its appearance being sufficiently characteristic to enable the observer to distinguish it from the only substance with which it is likely to be confounded, viz. Prussian blue.

It is not only extensively used in the manufacture of *green* teas, as will be explained hereafter, but we have detected it in small quantities entering into the composition of the colouring matters employed by the Chinese to "face" certain descriptions of *black* tea.

The quantity used in the facing of these black teas is very small, and were it not for the microscope this adulteration would altogether escape detection.

Indigo is possessed of medicinal properties, and we meet with the following account of its effects in "Pereira's Materia Medica."

"Its physiological effects, according to Dr. Roth (*Diss. Inaug. de Indigo*, 1834, Berol, and *British and Foreign Medical Review*, vol. ii. p. 244.), are as follows:—"Shortly after taking it, the patient experiences a sense of constriction of the fauces, and the impression of a metallic taste on the tongue. These are followed by nausea, and frequently by actual vomiting. The intensity of these symptoms varies in different cases. In some the vomiting is so violent as to preclude the further use of the remedy. The matter vomited presents no peculiarity, except in its blue colour. When the vomiting has subsided, diarrhœa usually occurs; the stools are now frequent, liquid, and of a blue or blackish colour. The vomiting and diarrhœa are frequently accompanied by cardialgia and colic. Occasionally these symptoms increase, and the use of the remedy is, in consequence, obliged to be discontinued. Dyspepsia and giddiness sometimes succeed. The urine has a brown, dark, violet colour; but Dr. Roth never found the respiratory matter tinged with it. After the use of indigo for a few weeks, twitchings of the muscles were sometimes observed, as after the use of strychnia. It has been employed principally in spasmodic affections, viz. epilepsy, convulsions of children, chorea, and hysteria. In epilepsy it has been tried by Von Stahly, Leuhossek, Grossheim, Ideler, Wolf, Leineweler, Doepp (*Roth. op.* Dierbach, op. cit. *Neust. Entd. in d. Mat. Med. Bd.* 1, § 222, 1837), and Noble (*Lond. Med. Gaz.*, vol. xvii. p. 1038), with good effect. Some of the successful cases were of very long standing. Roth says that at the commencement of the treatment, the frequency of the paroxysms was invariably increased. Idiopathic epilepsy is said to have been more benefited by it than the symptomatic epilepsy. The dose of indigo should be as large as the stomach can bear. At the beginning it may be a few grains; afterwards the quantity should be increased to drachms."

Turmeric Powder.

We have already, under the head of Mustard and its Adulterations, described the nature and structure of turmeric powder, and showed that it possesses an organisation sufficiently distinctive to allow of its being readily detected by means of the microscope. To this description it is sufficient on the present occasion simply to refer.

It also is one of the many substances employed by Chinese, and other fabricators of adulterated tea, to add colour and bloom to the surface of the leaves. It is usually used in combination with either indigo or Prussian blue, and powdered talc, soap-stone, or some other analogous powder; and although employed principally in the preparation of artificial green teas, we have yet detected turmeric powder in small quantity in the glazing of some few samples of black tea, it being met with in the same descriptions in which the indigo was discovered.

RESULTS OF THE MICROSCOPICAL AND CHEMICAL EXAMINATION OF NUMEROUS VARIETIES OF BLACK TEA AS IMPORTED INTO THIS COUNTRY.

1.

Assam Bohea.

Genuine.

2.

Common Java Congou.

Genuine.

3.

Good Common Congou.

Genuine.

4.

Common Congou.

Genuine.

5.

Finest Congou.

Genuine.

6.

Congou.

Genuine.

7.

Finest Congou.

Genuine.

8.

Souchong.

Genuine.

9.

Assam Souchong.

Genuine.

10.

Very Fine Real Souchong.

Genuine.

11.

Padræ Souchong.

Genuine.

12.

Tetsong.

Genuine.

13.

Fine Oolong.

Genuine.

14.

Spider-leaf Oolong.

Genuine.

15.

Pekoe Oolong.

Genuine.

16.

Fine Hyson-flavoured Oolong.

Genuine.

17.

Flowery Pekoe.

Genuine.

18.

Finest Flowery Pekoe.

Genuine.

19.

Assam Pekoe.

Genuine.

20.

Finest Assam Pekoe.

Genuine.

21.

Finest Java Flowery Pekoe.

Genuine.

22.

Finest Flowery Pekoe.

Genuine.

23.

Common Scented Orange Pekoe.

Adulterated—Leaves faced, after rolling, with *black-lead*, and bloomed with powdered *mica*, or *some other analogous irridescent powder.*

The leaves are straight, thin, wiry, and much twisted, with a black and somewhat shining surface. When carefully viewed in the dry state through a lens, and with a strong light, minute irridescent particles may commonly be observed; placed in cold water, the leaves gradually unfold, and present a dark appearance in those parts which formed the surfaces when dry; a thin section of one of these dark surfaces, viewed under the microscope, appears studded with numerous minute and perfectly black particles, which are those of plumbago, or black-lead. These results may be obtained on a larger scale, but not more satisfactorily, by agitating, for a few minutes, a drachm or so of the tea, in a cylindrical glass, with distilled water; this removes a part of the coating, which, after a time, falls as a blackish sediment, in which, with the microscope, both the black-lead and the talc-like particles may be detected; these last, when the sediment is allowed to dry on a slip of glass, exhibiting their characteristic lustre.

24.

Common Scented Orange Pekoe.

Adulterated—Leaves faced with the same substances as those discovered in the previous sample.

25.

Finest Scented Orange Pekoe.

Adulterated—Leaves blacker, more polished, thinner, more wiry than those of sample 23, and glazed with the same substances.

26.

Finest Scented Orange Pekoe.

Adulterated — In the same manner as sample 23.

27.

Finest Scented Orange Pekoe.

Adulterated — In the same manner as sample 23.

28.

Good Caper.

Genuine.

29.

Fine Scented Caper, or Chulan.

Adulterated — Leaves *broken*, and formed, by means of a *solution* of *starc* *little masses or nodules;* the surfaces of these are bright, and shine blackish or bronze-like lustre. Examined in the same manner as the s orange pekoe (sample 23.), they are discovered to be faced with the substances, — namely *black-lead* and *the irridescent powder*.

30.

Medium Scented Caper, or Chulan.

Adulterated — Leaves *more highly faced* than in the last sample, and w same substances; shining, in fact, with a strong metallic lustre.

31.

Commonest Scented Caper.

Adulterated — Highly, but *more coarsely glazed* with the same materials previous samples of scented caper or chulan; many of the mica-like pa being so large as to be plainly visible to the unaided sight, shining like spangles. In addition, there were present in this sample little masses described hereafter) formed of *tea-dust*, as well as fragments of *rice* or and other *husks*, glazed in the same manner as the tea-leaves themselve

Of this highly adulterated article 220 boxes were sold on the 13th of last, at public sale, for 11*d.* per lb.

32.

Scented Caper, or Chulan.

Adulterated — Faced in the same manner as the previous samples, and admixed with *the masses or nodules* prepared from *tea-dust.*

33.

Finest Scented Chulan,

Sometimes called

Black Gunpowder.

Adulterated — Leaves much broken, and formed into *smaller fragments* *those of ordinary caper-teas*, but coated with the same substances.

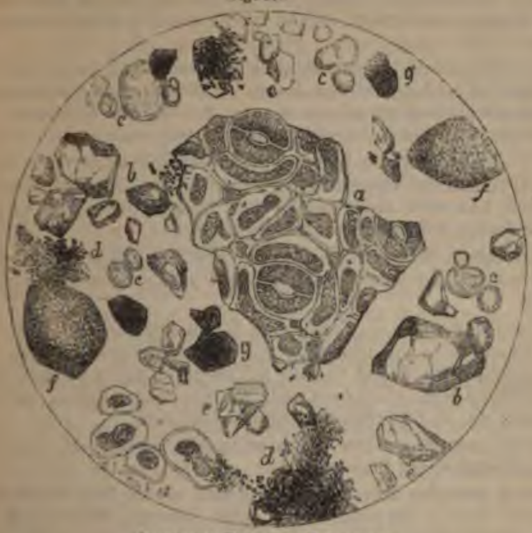
34.

Scented Caper.

(Overland Samples.)

Adulterated — This article consists of *little rounded particles of various* a brownish-black and dull-metallic hue; moistened with water, these crumble down into minute fragments. On careful examination with th croscope, the following substances were detected in each mass: num minute and *dust-like fragments of the tea-leaf;* altered *starch-corp* probably those of *rice;* with much *starch*, in a *granular* and *amorphous* a considerable quantity of *sand or grit; irridescent* and *mica-like part* *black granular matter; yellow vegetable cells;* and *granules* or *fragment* flecting a *bluish* or *greenish-blue colour*. The irridescent particles are evid those of the powder to which we have so often referred; the black gr matter is *plumbago;* the yellow vegetable cells are those of *turmeric po* and the blue granules or fragments consist of *indigo*. The masses co therefore, of tea-dust and sand, made up into nodules with starch, and with black-lead, the mica-like powder, and a very small quantity of tu ıdigo. The general appearance presented by the little lumps of which rticle is formed, is not unlike that of the dung of silkworms, with which, (it has been stated), the Chinese occasionally favour us.

Fig. 97.



IMITATION CAPER OR GUNPOWDER.

a a, fragments of the *tea-leaf* or *tea-dust*; *b b*, particles of *sand*; *c c*, *starch-corpuscles*; *d d*, groups of granules of *black-lead*; *e e*, particles of *mica-like substance*; *f f*, cells of *turmeric*; *g g*, fragments of *indigo*. Magnified 350 diameters.

ample upon which the above observations were made was one of many ed to this country. in the hope of procuring purchasers, these samples ortions of articles made in China in large quantities, in imitation of ıd green teas of different qualities. They were offered for sale in this at a very low price.

ature of this article, we have been given to understand, is known to the uthorities, the large quantity of tea lately destroyed by them was, we of this character.

e have seen, it is frequently mixed with caper or chulan and black der teas, and in this state, it is clear, eludes the vigilance of the excise, ı the fraud is one not difficult of detection.

35.

SCENTED CAPER.

(Overland Sample.)

ated—This article is *essentially the same as the foregoing.* Greater ıas evidently been bestowed on its preparation, it being manufactured to ent black gunpowder tea of higher quality. The lumps are much less ı, and more highly faced.

ecent number of the *Merchant*, we notice the following observations:—the *Friend of China*, we read, under the head of 'Scented Caper,' 7000 ten-catty boxes have been taken at taels $14\frac{1}{2}$ to 16 for spurious nd taels $16\frac{1}{2}$ to 22 for common to fine;' and, referring to Canton Greens, ise purchases of 500 half and 1200 ten-catty boxes, at 13 to 16 taels for , and 17 to 22 taels for common to good. We regret to find that this ous and nefarious trade is not yet abandoned."

purious Caper and Canton Greens, sometimes called "*lie tea*," referred above paragraph, are probably identical in composition with Samples 35.

onclusions to be deduced from the above analyses will be given hereafter.

RESULTS OF THE MICROSCOPICAL AND CHEMICAL EXAMINATION OF SAMPLES OF SPURIOUS TEA OF BRITISH FABRICATION.

Seized by the Excise, July, 1851.

1st Sample.—*Characters.*—Tea-leaves broken, misshapen, agglutinated, gloss and, when slightly moistened, sticky to the touch; infusion only very slightly coloured.

From these characters it is evident, independent of analysis, that the abov sample consists of *exhausted tea-leaves re-dried and adulterated with* gu Chemical analysis showed an excess of gum, but a great deficiency of tannin an colouring matter. As tea the article is completely worthless.

2nd Sample.—*Characters.*—Many of the tea-leaves in this sample prese their natural forms and appearances, being twisted and without gloss; othe of the leaves, however, are more or less broken or misshapen, with shinin surfaces; infusion coloured, but not highly so.

The examination of this sample with the eye alone is sufficient to show that consists of *exhausted tea-leaves made up with gum, and mixed with a proporti* [illegible]

3rd Sample.—*Characters.*—Tea-leaves much broken, but few twisted, man occurring as rounded or irregular masses, of a dark colour, with but litt gloss; examined with a lens and the microscope, many of the leaves are ascer tained to be faced with *black lead* and the *mica-like powder*; infusion coloure but not deeply so, and containing *sulphate of iron.*

For the above sample we are indebted to Mr. Bland. It was labelled, "B dried, damaged, and spent leaves."

The following samples have been furnished us by Mr. Phillips. They we seized by the Excise on the premises of John Stevens, of Liverpool, on the 1 of December, 1850. The penalty inflicted in this case was 250*l.*

4th Sample.—This sample consisted of a mixture of the entire dried leaves the [illegible] and *horse-chestnut.* From their condition it is evident that leaves had been collected in the green state.

5th Sample.—The leaves in this sample were so much broken down that it scarcely possible to identify them without the aid of the microscope.

6th Sample.—This sample consisted of large lumps of irregular shape, for of the broken leaves, including even the stalks, agglutinated with some dar coloured gummy substance. By tasting a small fragment of one of th masses, as well as by making an infusion with it, the fact was at once asce tained that the substance in question was *catechu.*

7th Sample.—This sample consisted of a large lump of the *catechu* used making up the leaves, and which was seized on the premises in the occupati of John Stevens, in which the manufacture of spurious tea was carried on.

8th Sample.—The leaves, agglutinated with catechu, were in this samp broken down into small pieces, which, however, *were destitute of lustre.*

9th Sample.—In this case the fragments were still more reduced, correspond in size with those of gunpowder-tea, and in place of being dull and lustrel as in the previous sample, they appeared bright and *glossy*, most probab from having received a coating of *gum*; the article was now ready either mixing, in the form of dust, with genuine black tea, or for being "faced" coloured, in imitation of green gunpowder tea.

The identification of the leaves in this case, without the aid of the microsc was completely impossible: with that instrument their determination was effec in the most satisfactory manner.

For this sample we are indebted to Dr. Muspratt, of Liverpool.

To the above analyses we now add the following account, extracted from *Times* of May 27th, 1851:—

"CLERKENWELL.—Edward South, and Louisa, his wife, were placed at bar, before Mr. Combe, charged by Mr. Inspector Brennan, of the G divis with being concerned in the manufacture of spurious tea.

"It appeared from the statement of the inspector, that in consequence information that the prisoners and others were in the habit of carrying on

sive traffic in manufacturing spurious tea on the premises situate at 27½.
enwell-close, Clerkenwell-green, on Saturday evening, at about seven
k, the witness, in company with Sergeant Cole, proceeded to the house,
they found the prisoners in an apartment, busily engaged in the manufacture
rious tea. There was an extensive furnace, before which was suspended
n pan, containing sloe-leaves, and tea-leaves which they were in the prac-
f purchasing from coffee-shop keepers, after being used. On searching
ace, they found an immense quantity of used tea, bay-leaves, and every
ption of spurious ingredients, for the purpose of manufacturing illicit tea,
hey were mixed with solution of gum and a quantity of copperas. The
f the place was so excessive, that the officers could scarcely remain in it,
e prisoners did not seem at all oppressed by it. The woman was employed
ring about the bay-leaves and other compositions with the solution of gum
pan; and in one part of the room there was a large quantity of spurious
he exact imitation of genuine tea. In a back room they found nearly
s. weight of re-dried tea-leaves, bay-leaves, and sloe-leaves, all spread on
or drying. The inspector told the prisoners that he was a police-officer,
so an inland revenue officer, and he must take them into custody, together
he whole of the ingredients and apparatus for making the spurious tea.
rennan added that the prisoners had pursued their nefarious traffic
extensively, and were in the habit of dealing largely with grocers,
ers, and others, especially in the country. The various articles produced,
o their completion, had the most disgusting appearance, and were evi-
prejudicial to health. He had communicated with the Excise authorities,
nsidered it a case of such importance to the public, that they requested
hdrawal of the present charge, in order that they might prosecute the
ers under the Excise laws; being determined, if possible, to put a stop to
bominable proceedings.

r. Brennan was complimented by the court for his exertions.

oceedings will be immediately instituted against the prisoners by the
ities of the Excise."

TS OF THE EXAMINATION OF NUMEROUS SAMPLES OF BLACK TEA PUR-
ED AT THE ESTABLISHMENTS OF DIFFERENT TEA-DEALERS AND GROCERS
DENT IN THE METROPOLIS.

mple.—Purchased of Mr. Dolamore, Westminster-bridge-road.
uine.

mple.—Purchased of Mr. Farmar, Westminster-road.
lterated—Being mixed with a small quantity of *Scented Caper*, or *Chulan*,
hich, like other samples of this tea, is faced with *black-lead* and a *mica-*
ke powder. There were also detected in this tea a few of the little masses
ade up with *tea-dust*, *starch*, &c., already described, and with which the
aper had no doubt been adulterated by the Chinese.

ample.—Purchased of Mr. Goodman, Westminster-road.
uine.

mple.—Purchased of Mr. Hopson, New-cut, Lambeth.
uine.

mple.—Purchased of Mr. Stevenson, 159. Whitecross-street.
uine.

mple.—Purchased of Mr. Roberts, Barbican.
uine.

mple.—Purchased of Mr. Hart, 21. Holborn-hill.
uine.

mple.—Purchased of Mr. Belchem, Drury-lane.
uine.

mple.—Purchased of Mr. Stanbury, 2. Portman-place, Edgware-road.
uine, but containing a large quantity of tea-dust.

ample.—Purchased of Bodley & Co., 5. Portman-place, Edgware-road.
uine.

ample.—Purchased of Salmon & Goatley, 19. Edgware-road.
uine.

12th Sample.—Purchased of Mr. Andrews, 57. Tottenham-court-road.
Genuine.

13th Sample.—Purchased of Strugnell & Co., 109. Edgware-road.
Genuine.

14th Sample.—Purchased of Mr. Stubbs, 140. Edgware-road.
Genuine.

15th Sample.—Purchased of Martin & Co., 147. Edgware-road.
Genuine.

16th Sample.—Purchased of Mr. Hall, 135. Edgware-road.
Genuine.

17th Sample.—Purchased of Mr. Horne, 124. Edgware-road.
Genuine.

18th Sample.—Purchased of Hawthorn & Co., 38. Tottenham-court-road.
Genuine.

19th Sample.—Purchased of Mr. Back, 123. Tottenham-court-road.
Genuine.

20th Sample.—Purchased of Mr. Clark, 135. Tottenham-court-road.
Genuine, containing a good deal of tea-dust.

21st Sample.—Purchased of Mr. Belcher, Holles-street, Oxford-street.
Adulterated.—This sample is one of *scented Orange Pekoe*, and is adulter and faced in the manner usually practised by the Chinese with this des tion of tea—viz., with *black-lead*, and a powder resembling *mica.*

22nd Sample.—Purchased of Mr. Staniforth, Oxford-street.
Adulterated.—This also is a sample of *scented Pekoe.*

23rd Sample.—Purchased of Sydney, Manduell, & Wells, Ludgate-hill.
Adulterated.—This is a sample of *scented Caper or Chulan*, and is fac the manner usually practised by the Chinese with this particular kin tea—that is, with *black lead* and a *mica-like powder.*

24th Sample.—Purchased of Sparrow & Co., Oxford-street.
Adulterated.—This also is a sample of *scented Caper*, glazed in the manner.

From a consideration of the First of the Three Tables of Analyses given, it appears—

1st. That *not one* of the *Thirty-five* samples of black tea, as imported this country, *contained any other leaf than that of the tea-plant.*

2nd. That out of the above number of samples, *Twenty-three* were gen and *twelve* adulterated. The genuine teas were the *Congous* and *Souch* &c., and the adulterated teas, samples of *Scented Pekoe* and *Scented C Chulan or black gunpowder*, as well as *imitations of these made tea-dust.*

3rd. That the adulterations detected consisted in facing, so as to improv appearance of the teas, the surfaces of the leaves with *black-lead, an descent powder resembling mica, indigo*, and *turmeric*, and in the m facture of imitation tea out of *tea-dust, sand, &c.*

The Second table affords conclusive evidence—

1st. That the fabrication of spurious black tea is extensively carried on present time in this metropolis, and in other towns of the kingdom.

2nd. That two processes of fabrication are adopted. In the first, *the exha tea-leaves* are made up with *gum*, and re-dried; *black lead*, and the *like powder, rose-pink*, and *carbonate of lime* being sometimes add bloom or face the leaves, as well as *sulphate of iron* to darken the colo the leaves, and to give astringency. In the second, *leaves other than of tea* (the kind matters but little) are used. These, after being dried broken down, mixed with gum *catechu*, and made into a paste; the l are then re-dried, and further broken down, and sometimes coated with The spurious tea made from exhausted leaves is seldom sold alone, used either for mixing with genuine black, or is converted into green the manner to be described hereafter; while that made from British and catechu is either mixed with black tea in the form of dust, or faced and bloomed, until it is made to resemble green tea.

rom the Third table it appears, —

t. That out of the *twenty-four* samples of black tea purchased of tea-dealers and grocers resident in the metropolis, *Twenty* were *genuine*, and *Four adulterated;* the former being *Congous* and *Souchongs*, and the latter samples of *Scented Pekoe* and *Scented Caper*.

reference to the four adulterated samples of tea, it is right to state, that the slightest blame is attached to the dealers from whom they were pur-ed, they being in all probability wholly unaware of the fact of these cular descriptions of tea being adulterated or faced in the manner described. samples were introduced, in order to show that these teas do really reach onsumer in an adulterated condition.

thus appears, that while the great bulk of the black tea used in this country z., Congou and Souchong — as delivered to the consumer, is in a genuine , the scented teas — viz., the Pekoes and Capers—are invariably adulterated. stly, that from the extensive fabrication of spurious black tea in this coun-it is necessary that the purchaser should be constantly on his guard.

GREEN TEA, AND ITS ADULTERATIONS.

RDING to most writers there is but one species of tea-plant from which the e of the numerous varieties of tea, both black and green, are obtained, the ences in colour, quality, &c., resulting from soil, climate, age of the leaves, mode of preparation.

e have already pointed out, in a very brief manner, the principal differences e cultivation and preparation of black and green teas.

e plants from which black teas are prepared are grown chiefly on the slopes lls and ledges of mountains: the leaves are obtained in three, and, in some , even four gatherings, those of medium size and age being chiefly used for reat bulk of the black tea—viz., the congous and souchongs: they are dried r under covered sheds, open at the sides, which is the best method, or else posure to the sun. This process is a somewhat lengthened one, and during degree of fermentation is set up, which is intimately associated with the r, scent, and flavour of the leaves. Lastly, the leaves are subjected to a le process of roasting; first in a shallow iron pan, termed a *kuo*, an opera-which is repeated two or three times, as may be necessary; and second, in s called *poey longs*, over a bright charcoal fire.

e shrubs which furnish the leaves from which green tea is prepared are cul-ed in manured or garden soils; the leaves are greener, more tender, and , and two gatherings of them only are made: "the first begins between the of April and the 5th of May, and lasts for about ten or fifteen days; and econd at the summer solstice." After gathering, the leaves should be dried oasted as soon as possible, in fact the same day, that is, before the slightest entation has had time to set in, all exposure to the air being unnecessary, o the sun injurious. During the roasting, which is repeated once or twice in *uo* only, the second method — viz., that in the *poey long* — not being prac-, the leaves are at the same time fanned, to hasten the drying, by dissipating noisture which rises during the operation.

ch is a general statement of the cultivation and preparation of black and n teas. The same distinctions and care are not always, however, observed; ently the same shrubs, and even the same leaves, are made to furnish both and green teas of different qualities.

e development of the characteristic colour of the leaves of green tea is d to take place during the third roasting in the *kuo*, the leaves at the end of econd roasting being of "a dark olive colour, almost black."

In the third roasting," says Mr. Ball, "which is, in fact, the final drying, eat of the fire was again diminished, and reduced to the degree which the can bear for some seconds without much inconvenience; the quantity put the *kuo* was greatly increased, and the time of roasting regulated by means e instrument denominated a *che kiang*. The fanning and the mode of ing were the same as in the final part of the second roasting. It was now us to observe the change of colour which gradually took place in the leaves for it was in this roasting that they began to assume that bluish tint, resemblin the bloom on fruit, which distinguishes this tea, and renders its appearance agreeable.

Thus it is obvious that the peculiar colour of green tea does not properly ari from the admixture of colouring matter with the leaves, but naturally out of th process of manipulation." *

Mr. Jacobson writes,—

"Now the colour becomes greener and brighter; but, properly speaking, th infused leaf only is green, the dry leaf is bluish. As the drying progresses, th leaves assume a light blue tinge, resembling the bloom of grapes." †

The principal varieties of green tea are Twankay, an inferior descriptio Hyson, Young Hyson, Hyson Skin, Gunpowder, and Imperial; all these, exce the Twankay, are obtained from unsorted Hyson, or Mao Cha, in the man described by Mr. Ball and Tien Hing.

"In this state (that is, after the third roasting, and the production of the quisite colour)," continues Mr. Ball, "the tea is usually packed in chests in th tea country, and called Mao Cha, from its being unsorted. The Ching Cha the Hyson tea, after the Hyson Skin, Young Hyson, and Gunpowder have b separated from it. Both kinds are sold in the tea country, though it is co monly sold by the farmers and peasantry in its gross or unsorted state of M Cha; and from the samples of this tea which I have seen at Canton, I imagi that many Hysons are sold to foreigners in this state, without any further sifti or separation."

"In about a fortnight," Tien Hing observes, "every farm has completed harvest, and sends its tea to market: at the same time the numerous fact attend the different villages to make their purchases. There are all the vari kinds of tea sold—the Mao Cha, the Ching Cha, the picked, the unpicked, garden, and the hill tea, and the different kinds of Singlo tea; so that it requ a complete acquaintance with the leaf and colour to be enabled to make a j cious selection. When the factors have concluded their purchases, they ca their tea home, where it is sifted, winnowed, and assorted into different ki suited to the foreign markets.

"The large closely-twisted leaves, of nearly equal size and brightness of colo form the Hyson tea.

"The large, open, or coarsely-twisted leaves, and also the large, rou knobby leaves, of nearly equal colour, form the superior Hyson Skin teas; the thin twisted leaves, of good colour, with the yellow and broken leaves, middling kinds.

"The small round, closely-curled leaves, which are bright in colour, form round Gunpowder; the stil smaller and more closely-curled leaves, the C Ma, the hemp-seed, or small imperial Gunpowder.

"The broken leaves, which are very thin and small, and of a wiry nat form the U Chien, or Young Hyson. The fine dust, and part of a kind of ch dust, is sold in the tea country; also at King-te-ching, the celebrated town the manufacture of porcelain, and other places. The remainder of the dust mixed with common Hyson Skin."

Twankay tea is grown in the province of Kiang Nan; its manipulation d not differ essentially from that of Hyson tea, but is performed with less care

Tien Hing‡ gives the following account of its preparation:

"The Senglo tea is grown in all parts of Kiang Nan, but Hoang Shan Tuon Ky produce the best. The leaves begin to bud every year, about the of April (Tsing Ming), and are gathered about the 20th of April (Ko Yu). is gathered by whole branches at a time, and the leaves and stalks are af wards stripped off rudely with the hands. It is then roasted in a *kuo*, rolled indifferently with the hands or feet. It is gathered and roasted ev day, and sold as soon as made. The factors who purchase it carry it home, roast it again two or three hours, when it is sifted (to take away the dust) packed in canisters. Some of the factors use charcoal, others wood; and th are some petty dealers, who do not roast it immediately, but pile it up in th houses, and afterwards roast and pack it."

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* Ball on the Cultivation and Manufacture of Tea, p. 230.

† Handbook, p. 456.

‡ Ball, loc cit p. [illegible]

ADULTERATION OF GREEN TEA.

though, as appears from the evidence quoted, there is good reason for
ving that there really is such a thing as a genuine *green* tea, yet there are
conclusive facts to show that the green colour is very frequently imparted
tificial means.

fore adducing any observations of our own, we will cite the remarks and
ments made by various writers on this point.

Dr. Horsfield's translation of a Dutch work on the subject of the cul-
ion of tea in Java, the following dialogue occurs:—

Visitor.—Is it indeed the case that tea is so much adulterated in *China?*

Superintendent.—Unquestionably, but not in the interior provinces, for
exist rigid laws against the adulteration of tea; and all teas, as they come
f the plantations, are examined on the part of the government, to deter-
whether they are genuine; but in Canton, which is the emporium of teas,
specially at Honân, many sorts, indeed most teas, are greatly adulterated,
hat with ingredients injurious to health, especially if too much of these
dients be added. This is especially the case with the *green* tea, in order
prove the colour, and in this manner to add to the value of the teas in the
of the common consumers.

Visitor.—Are these ingredients known?

Superintendent.—Most of them are certainly known; they have been com-
cated to government (the Dutch government,) while at the same time the
ege has been requested that they might not be employed here; and
ugh this occasions loss, the request has been granted, and it has been
ed by government, that not the least admixture should take place, either
prove the colour or taste of the tea, even in such cases where this might
sirable."*

Royle writes†, "The Chinese in the neighbourhood of Canton, are able
pare a tea which can be coloured and made up to imitate various qualities
en tea, and large quantities are thus yearly made up."

oung Hyson," states Mr. Davis‡, "until spoiled by the large demand of
mericans, was a delicate genuine leaf, and as it could not be fairly pro-
in any large quantities, the call for it on the part of the Americans was
red by cutting up and sifting *other* green teas through sieves of a certain
and as the Company's inspectors detected the imposture, it formed no
n of their London importation. But the abuse became still worse of late,
e coarsest *black* tea-leaves have been cut up, and then *coloured* with a
ration resembling the hue of green teas."

ut this was nothing," continues Mr. Davis, "in comparison with the
tery which the Chinese displayed in carrying on an extensive manufacture
en teas from *damaged black leaves*, at a village or suburb called Honân.
he remission of the tea-duties in the United States occasioned, in the
1832 and 1833, a demand for green teas at Canton, which could not be
ied by arrivals from the provinces. The Americans, however, were
d to sail with cargoes of green teas within the favourable season; they
determined to have the teas, and the Chinese were determined that they
d be supplied. Certain rumours being afloat concerning the manufacture
en tea from old black leaves, the writer of this became curious to ascertain
uth, and with some difficulty persuaded a Hong merchant to conduct him,
panied by one of the inspectors, to the place where the operations were
d on. Entering one of these laboratories of fictitious Hyson, the parties
witnesses to a strange scene. The damaged black tea-leaves, after being
were transferred to a cast-iron pan, placed over a furnace, and stirred
ly with the hand, a small quantity of turmeric, in powder, having been
usly introduced. This gives the leaves a yellowish or orange tinge, but
were still to be made green. For this purpose some lumps of fine blue
produced, together with a substance in powder, which from the names
to them by workmen, as well as their appearance, were known at once to
ussian blue and gypsum. These were triturated finely together with a

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ay on the Cultivation and Manufacture of Tea in Java. Translated from the Dutch.
e, Medicinal and Dietetical.—*Penny Cyclopædia.*

‡ Davis' Chinese, vol. ii. p. 461.

small pestle, in such proportions as reduced the dark colour of the blue to a light shade; and a quantity equal to a tea-spoonful of the powder being added to the yellowish leaves, these were stirred as before over the fire, until the tea had taken the fine bloom colour of Hyson, with very much the *same scent.* To prevent all possibility of error regarding the substances employed, samples of them were carried away from the place. The Chinese seemed quite conscious of the real character of the occupation in which they were engaged; for on attempting to enter several other places where the same process was going on, the doors were speedily closed upon the party; indeed, had it not been for the influence of the Hongist who conducted them, there would have been little chance of seeing as much as they did."

Mr. Bruce states, that "in the last operation of colouring the green teas, a mixture of sulphate of lime and indigo, very finely pulverised, and sifted through fine muslin, in the proportion of three of the former to one of the latter, is added: to a pan of tea, containing seven pounds, about half a tea-spoonful of this mixture is put, and rubbed and rolled along with the tea in the pan for about an hour. The above mixture is merely to give it a uniform colour and appearance. The indigo gives it the colour, and the sulphate of lime fixes it. The Chinese call the former *youngtin;* the latter, *acco.*"*

But valuable and conclusive evidence, in relation to the artificial colouring of green tea, was obtained by Mr. Warrington, from whose paper, communicated to the Chemical Society, in 1844, we shall now make several extracts.

"In examining lately some samples of tea which had been seized from their being supposed to be spurious, my attention was arrested by the varied tints which the sample of green tea exhibited, extending from a dull olive to a brig greenish-blue colour. On submitting this to the scrutinising test of examinatio by the microscope with a magnifying power of one hundred times linear, the object being illuminated by reflected light, the cause of this variation of colo was immediately rendered apparent, for it was found that the curled leaves we entirely covered with a white powder, having in places a slightly glistenin aspect, and these were interspersed with small granules of a bright blue colo and others of an orange tint; in the folded and consequently more prote parts of the curled leaves these were more distinctly visible. By shaking th whole of the sample mechanically for a short time, a quantity of powder w detached, and from this a number of the blue particles were picked out under magnifying glass, by means of the moistened point of a camel's-hair pencil. O being crushed in water between two plates of glass, they presented, when vi by transmitted light, a bright blue streak. This change in the method o illuminating the object was necessary for the purpose of seeing the action of t following tests. A minute drop of a solution of caustic potash was introdu by capillary action between the glass plates, and the blue tint was immediat converted to a dark bright brown, and the original blue colour again rest by the introduction of a little dilute sulphuric acid. It was therefore evid that these particles consisted of the ferrocyanide of iron, or Prussian blue. Th orange granules on examination proved to be some vegetable colouring su stance.

"To ascertain if possible the nature of the white powder observed in th sample, I separated some of the dust, and heated it to redness, with free e posure to the air; the whole of the vegetable matter and Prussian blue w thus destroyed, and a white powder with a shade of brown was obtained. Th dissolved by boiling in dilute hydrochloric acid, and when tested with solut of chloride of barium, gave indications of sulphuric acid; it was then evapo to dryness, and again acted on by very dilute hydrochloric acid; a trac silica remained undissolved: solution of ammonia being added, threw dow little alumina and oxide of iron, and the ammoniacal solution treated with oxal acid gave a precipitate of oxalate of lime. A second portion of the powder, afte calcination, was boiled for some time in distilled water, and yielded a so containing sulphate of lime. This latter substance, therefore, and some substance containing silica, alumina, and perhaps lime formed the white p observed. This substance I believe to be kaolin or powdered agalmatolit

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* Report on the Manufacture of Tea, and on the Extent and Produce of the Tea Plantations in By C. A. Bruce, Superintendant of Tea Culture. Presented to the Tea Committee, August 183

the Chinese; I should venture this conjecture, not only from
found, but from the gloss which the rubbed parts of the curled
sume, and which these materials would be well fitted to produce."
on then proceeds to state the results derived from the examin-
l samples of green tea, as imported, and the whole of which
rtificially coloured. In reference to unglazed teas the following
ur :—

g what I had thus found to the friend who had favoured me
ng samples, he inquired if I had examined any *unglazed teas.*
immediately arrested my attention, and I requested to inspect
nd found that they possessed externally a totally different aspect;
their colour was concerned, not to be like green teas. They
w-brown tint, without a shade of green or blue, but rather
rubbed part to a blackish hue. I afterwards received two
zed teas specified as of a very fine quality, accompanied by two
inary, or as they were called, in contradistinction, glazed varieties,
perior quality. These were, therefore, immediately submitted
No. 6. Unglazed Gunpowder: It presented the same colour
scope as when viewed by the unassisted eye; was filamentous,
h a white powder, inclining to a brown tint, but no shade of blue
. 7. Unglazed Hyson: The same as No. 6. No. 8. Gunpowder:
ous, covered with a powder of a very pale blue, and the blue
ut rarely seen. No. 9. Hyson: The same as No. 8."

on thus sums up the conclusions to be derived from his inves-

therefore, from these examinations, that all the green teas that
o this country are faced, or covered superficially, with a powder
her Prussian blue and sulphate of lime or gypsum, as in the
ples examined, with occasionally a yellow or orange-coloured
nce; or of sulphate of lime, previously stained with Prussian
8 and 9, and one of those first investigated; or of Prussian blue,
red substance, with sulphate of lime, and a material supposed to
the original sample; or of sulphate of lime alone, as in the
es.

us question, what the object for the employment of this facing
imply added as an absorbent of the last portion of moisture,
entirely dissipated in the process of drying? or whether, is it
e, to give that peculiar bloom and colour so characteristic of the
n tea, and which is so generally looked for by the consumer,
the green colour, as in the unglazed variety, I am informed,
g prices most materially? This surely can only arise from the
ve facts being generally known, as it would be ridiculous to
ainted and adulterated article—for such it must really be con-
maintain a preference over a more genuine one."

valuable work, already so frequently quoted, we meet with the
ations relating to the artificial or factitious colouring of certain
reen tea :—

—viz., The Singlo Hysons and 'Superior Twankay,' have
zed appearance, as also the Singlo Gunpowders, which I imagine
ave arisen more from the quality of the leaf than from any
employed to produce the colour. Still in some cases a small
ring matter may have been used. It has also been shown that
n the Honân leaves had a glazed appearance. It nevertheless
n the leaf is deficient in the requisite colour, the Chinese do not
y colouring matter to improve it.

far as the characteristic colour of green tea is concerned, the
ng it has been explained and established. If factitious means
ly or almost universally adopted to imitate or increase the effect
olour, it may be considered as a great and novel abuse, and
couraged by brokers and dealers. It is injurious to flavour.
inese do employ colouring matter or not for the teas they use
e can be no doubt that the bulk of the Hyson teas of the present

day, and indeed all descriptions of green tea, are now glazed to a degre would have insured their rejection by the East India Company." *

Tien Hing, described by Mr. Ball as a respectable tea merchant and in his account of the method of making Twankay tea, writes,—

"In the seventh or eighth moon (August and September) each parcel pared together, when such as correspond in quality and colour are form one pile, roasted three *che hiang*, the dust sifted, and the tea packed (chests for Canton. The leaves of the second gatherings have no juic light, thin, and of no substance; the infusion weak and tasteless, the red, and the infused leaves black. If very common and old colouring m then used, and the tea is kept in the †. The factitious colour is prod a mixture of Ma Ky Hoey ‡, Tien Hoa (indigo), and She Kao powder (c foliated gypsum). The smallest quantity put into the *kuo* at one time is two teaspoonfuls, and the largest three or four. The colour then chan light blue. The fire must be made of charcoal, and much attention paid roasting. Now, if the chests be not in readiness, it is to be feared the t be mixed with false leaves, the smell thereby injured, and the tea rende healthy. But I must refer you to abler men than myself for instruction point. I have no information on such practices."

Mr. Ball then goes on to state "that most other merchants or facto with the foregoing account of the Twankay teas, and particularly as circumstance of their being partly glazed or coloured by artificial and also that some chops are mixed with leaves that are not tea-leaves."

It is then clearly proved, by the above evidence, that many of the gr imported into this country owe their colour to factitious means, and are fore, adulterated, and have been so for many years past. We shall h give analyses of numerous samples of green tea, when we shall be estimate more exactly the extent and character of the adulterations prac

In the article on black tea we described several substances, employe for the purpose of facing and colouring the surface of the leaves or to astringency to the exhausted leaves.

The substances described were—

STARCH
GUM
CATECHU
SULPHATE OF IRON
ROSE PINK
LOGWOOD

BLACK LEAD
TALC
CHINA CLAY
SOAP-STONE
INDIGO
TURMERIC

In addition to the above, it has been ascertained that many other sub are employed, and these we will now notice.

The colours used in the facing of green tea are usually three: yello and white. The yellow and blue colours, when mixed, form a green, an is added, either to lessen the intensity of the former colours, or else polish to the surface of the leaves.

PRUSSIAN BLUE.

Prussian blue is a *ferrocyanide of iron*, and is the blue substanc frequently employed in the facing of spurious green tea.

It is distinguished from indigo by the iron which enters into its comp and which may be detected by the ordinary tests, as well as by the non-c chlorine in bleaching it.

Under the microscope it may be recognised by the form and colour particles of which it consists, as also by the action of liquor potassæ an sulphuric acid; the first turns the fragments of a reddish hue, and th restores the colour.

Although not absolutely poisonous, yet when introduced into the syste in minute quantities, it is in some cases capable of exerting an injurious

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* [illegible] 254.

† [illegible] expression, which has an allusion to the mode practised by pet [illegible]

‡ The name of a plant.

MINERAL GREEN.

"When a salt of copper is precipitated by an alkaline carbonate, *a hydrated* *-carbonate* is produced, containing two equivalents of oxide of copper, and e equivalent of carbonic acid. It is a pale blue, bulky precipitate, which omes denser and green when treated with boiling water. It is used as a ment, and is known as *mineral green*. The beautiful native green *carbonate* *copper*, *Malachite*, is of the same composition." (*Graham.*) It is a poi-ous substance.

VERDIGRIS.

Verdigris is a *sub-acetate of copper*, formed by placing plates of the metal in tact with the fermenting juice of the grape, or by wrapping them in cloths ted with vinegar. It is of a highly poisonous nature.

ARSENITE OF COPPER.

This substance also is highly poisonous.

DUTCH PINK.

Although called *Dutch pink*, this substance is if a bright yellow colour; it sists of a vegetable dye in combination with chalk or carbonate of lime. It the yellow pigment most frequently used in this country in the facing of rious green tea.

CHROMATE OF POTASH.

This salt is of a bright yellow colour; its properties are thus described in reira's "Materia Medica:"—

"The local action of chromate of potash is irritant and caustic; swallowed in ge doses it acts as an irritant and caustic poison. In smaller does it oc-ions vomiting, and is used as an emetic instead of tartarized antimony, than ich it less frequently purges. After its absorption it acts specifically on the cous surfaces, (especially the conjunctiva and the bronchial and nasal cous membranes, which it irritates, and even inflames, and whose secretions augments,) and also on the nervous system, causing paralysis and con-sions. Dose, as an emetic, from two to four grains for adults, and from a in to a grain and a half for children.

BICHROMATE OF POTASH.

This is of an orange-red colour. "Its topical action is that of an irritant d caustic. Its solution irritates the skin. In workmen who habitually ploy it, it occasions an eruption of papulæ, which after a little time become ular; and if the use of it be continued, the pustules degenerate into sloughs, d painful ulcers are in this way formed. Introduced into the stomach, or plied to wounds of animals, it causes vomiting, difficulty of respiration, ralysis, convulsions, and death. In the human subject several fatal cases of soning by it have occurred. Bichromate of potash has been used as an ernal agent only."—*Pereira.*

CHROME YELLOW.

This substance is a *chromate of lead*, and although insoluble in water, yet n introduced into the stomach, is dissolved by the acids contained in that gan.

CHALK.

Chalk, or *carbonate of lime*, enters, as already stated, into the composition Dutch pink; we have also met with it in one of the blue dyes used by the inese to colour spurious green tea.

GYPSUM.

Gypsum, or *sulphate of lime*, as we have seen from some of the accounts viously quoted, is very commonly used by the Chinese in blooming the yes.

CARBONATE OF MAGNESIA.

This substance has been occasionally used in this country for the same purpose as soap-stone, China clay, mica, &c., viz. to bloom the leaves.

STEATITE, SOAP-STONE, OR FRENCH CHALK.

Since the short notice and description which we gave of this substance appeared, the following observations relating to it have been brought under our notice. They were published in the "Household Words" under the title of "Death in the Tea-pot":—

"By the help of Mr. Silvers, we were enabled in a recent number to expose to an injured public some of the ingredients of metropolitan milk—'London Genuine particular.' A correspondent now makes a further revelation of how our tea-pots are defiled when it is innocently supposed that a pure beverage is in course of concoction.

"'A short time since,' he says, 'a friend of mine, a chemist in Manchester, was applied to for a quantity of French chalk, a species of talc, in fine powder; the party who purchased it used regularly several pounds a week. Not being an article of usual sale in such quantity, our friend became curious to know to what use it could be applied; on asking the wholesale dealer who supplied him, he stated his belief, that it was used in '*facing*' tea (the last process of converting black tea into green), and that within the last month or two, he had sold in Manchester upwards of a thousand pounds of it. Our friend the chemist then instituted a series of experiments, and the result proved that a great deal, if not all the *common* green tea, used in this country is coloured artificially. The very first experiment demonstrated fraud. The plan adopted was as follows.—A few spoonfuls of green tea at five shillings a pound, were placed on a small sieve, and held under a gentle stream of cold water flowing from a tap for the space of four or five minutes. The tea quickly changed its colour from green to a dull yellow, and upon drying with a very gentle heat, gradually assumed the appearance of ordinary black tea. On making a minute microscopic examination of the colouring matter washed from the leaf, and which was caught in a vessel below, it appeared to be composed of three substances, particles of yellow, blue, and white. The blue was proved to be Prussian blue,—the yellow thought to be turmeric, and the white, French chalk. If the two former be mixed together in fine powder, they will give a green of any required shade. It is made to adhere to the tea-leaf by some adhesive matter, and then it is 'faced' by the French chalk, to give it the pearly appearance so much liked.

"'This simple experiment any one can perform. A gentleman assured me that a friend of his a short time since happened—though quite unintentionally on his part—to walk into a private room connected with the establishment of a wholesale tea-dealer, and there he saw the people actually at work converting the black tea into green; the proprietor soon discovered his presence in the room, and before him, in no measured terms, severely reprimanded the workmen for having permitted a stranger to enter.'"

CHINESE TEA DYES.

Through the kindness of Mr. Smith, of the Royal Botanic Gardens, Kew, we have received portions of three different colours or dyes—a yellow, blue, and white—just brought over to this country from China, and taken from a factory in which the manufacture of spurious green tea was in actual progress.

The yellow dye was compounded in nearly equal proportions of both vegetable and mineral ingredients. The vegetable matter was ascertained by the microscope to be turmeric; while the earthy matter consisted of numerous glistening particles of mica, visible to the naked eye, but still better seen with a lens, as well as of a finely-powdered substance, of a yellow colour, and which, when viewed with an object-glass of a quarter-inch focus, presenting a broken crystalline structure. This fine powder was probably also *micaceous*; the colour with which it was stained was vegetable, as shown by the circumstance that it was destroyed by chlorine, and was most likely derived from the turmeric by absorption.

he object of the admixture of the powdered mica with the turmeric was, no bt, first, to lessen the intensity of the colour of that substance; and, second, ssist in the blooming of the leaves.

he *blue dye*, when spread out on a slip of glass, was seen either with the , or, better still, with a lens, to be made up of two substances, the one white, other blue; the latter was insoluble in water; its colour was destroyed by rine: it presented characteristic appearances under the microscope, and sisted of *indigo*. The former was also insoluble in water, effervesced on addition of an acid, as seen under a low object-glass, and answered to tests for lime: it therefore consisted of *carbonate of lime*.

he chalk was evidently admixed with the indigo for the purpose of reducing olour.

he *white powder* possessed a faint pink or rosy hue, and was *China clay aolin*, that is, decaying *granite*, the chemical composition of which has ady been given; to the touch, the powder felt soft and slippy, and owing to minuteness of the particles composing it, but very few fragments of mica ld be detected in it, even when spread out on glass, and viewed through ns. This substance was doubtless used to bloom or face the leaves after they been coloured with the yellow and blue dyes.

ON SPURIOUS GREEN TEA OF BRITISH FABRICATION.

ut the practice of converting black into spurious green tea by the addition of ouring matter, is not confined to the Chinese. In this country, for many rs past, this practice has extensively prevailed, and persons have been de- ted from time to time who, in the perpetration of this fraud, have even out- e the Chinese themselves.

hus, in some cases, parties have been discovered engaged in the manufacture green tea out of used tea-leaves, both black and green, and in others they e been detected in making an imitation green tea of leaves other than those he tea-plant.

ven so far back as the reign of George I., that is, shortly after the intro- tion of tea into this country, and while the quantity imported was still but all, it was found necessary to check, by legislative enactment, the adultera- to which tea at that early period was subject: thus, by 2nd Geo. I. cap. 30, . 4, it is declared,—"That the dealer in tea, or manufacturer or dyer thereof, o shall counterfeit or adulterate tea, or shall alter, fabricate, or manufacture ith *terra japonica*, or with any other drug or drugs whatsoever, or shall with tea any leaves other than leaves of tea, or other ingredients whatso- r, shall forfeit the sum of one hundred pounds."

"In 1778," writes Accum, "there was a printed circular signed by the heads- n and secretary of a company of grocers in Norwich, stating that they had n shown a small quantity of green tea, *one fourth part of which was avowedly -leaves*, yet so well manufactured as almost to prevent detection; and there nother counterfeit of Hyson tea, which is a strong deception: so much for closeness of the imitation." *

n the year 1818, the *Times* and *Courier* report the prosecutions and convic- s of numerous individuals detected in the manufacture of spurious tea, and ich show the extent to which this fraud was at that time carried on in the tropolis and elsewhere.

One of these cases is thus reported in the *Times*, May 18th, 1818:—

"*The Attorney-General against Palmer.*—This was an action by the At- ney-General against the defendant Palmer, charging him with having in his session a quantity of sloe-leaves, and white-thorn leaves, fabricated into an itation of tea. Mr. Dauncey stated the case to the jury, and observed that the endant, Mr. Palmer, was a grocer.

"It would appear that a regular manufactory was established in Goldstone- eet. The parties by whom the manufactory was conducted, was a person of name of Proctor, and another person named J. Malins. They engaged ers to furnish them with leaves. The leaves, in order to be converted into article resembling black tea, were first boiled, then baked upon an iron plate;

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* A Treatise on the Adulterations of Food, 2nd edition, p. 216.

[illegible] rubbed with the hand to produce that curl which the genuine [illegible] was yet to be given to it, was produced by logwo[illegible] [illegible] in a manner more destructive to the constitu[illegible] [illegible]. The leaves being pressed and dried, were [illegible] received their colour from an article kno[illegible] [illegible]. The article used in producing the appearance [illegible] [illegible] on the China tea, was, however, decidedly [illegible] [illegible] verdigris, which was added to complete the opera[illegible] [illegible] had to bring before the jury; and hence it wo[illegible] [illegible] were supposing they were drinking a pleas[illegible] [illegible] they were, in fact, in all probability, drinking the pr[illegible] [illegible] metropolis, prepared for the purposes of decepti[illegible] [illegible].

"[illegible] proved that he knew Proctor, and was employed by him at th[illegible] [illegible] gather black and white thorn leaves. Sloe leave[illegible] [illegible]. Witness also knew John Malins, the son of Willi[illegible] [illegible] he did not at first know the purpose for which th[illegible] [illegible] afterwards learnt they were to make imitation te[illegible] [illegible] one hundred and a half weight of these leave[illegible] [illegible] the name of Bagster to gather them. H[illegible] [illegible] per pound for them. They were first boiled and the wate[illegible] [illegible] a press. They were afterwards placed on a slow fi[illegible] [illegible]; while on the copper they were rubbed with th[illegible] [illegible]. At the time of boiling there was a little verdigris put int[illegible] [illegible] green tea only). After the leaves were dried, the[illegible] [illegible] separate the thorns and stalks. More virdigris and some Dut[illegible] [illegible]. The verdigris gave the leaves that green bloom ob[illegible] [illegible] tea. The black tea went through a similar course as th[illegible] [illegible] the application of Dutch pink: a little verdigris was put in th[illegible] [illegible] was added a small quantity of logwood to dye it, and th[illegible] [illegible] complete.

"[illegible] proved that he had been employed by Malins and Proctor t[illegible] [illegible] leaves; they were taken to Jones's house, and fro[illegible] [illegible] Malins's coffee-roasting premises. Witness received two-pence p[illegible] [illegible] he saw the manufacturing going on, but did not know muc[illegible] [illegible] Witness saw the leaves on sheets of copper, in Goldstone-street.

"[illegible] the case for the Crown. Verdict for the plaintiff 840*l.*"

From [illegible] date of the above conviction up to the present year, discoveries [illegible] spurious [illegible] manufactories have on many occasions been made, and seizures [illegible] the various articles used in the fabrication effected by the Excise authorities; [illegible] some of these we shall shortly refer.

Up to a certain point the process adopted in this country in the manufactu[illegible] of artificial green tea is the same as that for black. If exhausted tea-leaves, eith[illegible] black or green, or a mixture of these, are used, they are made up with gum [illegible] if leaves other than those of tea are employed, they are broken up and prepare[illegible] with catechu in the manner described under the head of black tea; it is in th[illegible] colouring alone that the difference consists.

The colouring matter so disguises the character of the leaves — the tints [illegible] green tea, as imported, are so closely imitated — that the detection of this frau[illegible] is not easy. We have now in our possession samples of spurious green te[illegible] which, by the eye alone, it would be impossible to discriminate with any cer[illegible]tainty. One of these was kindly prepared for us by Mr. Phillips, in the follow[illegible]ing manner, in order to show how exact an imitation, with care and skill, migh[illegible] be made. "The tea itself," writes Mr. Phillips, "is black, and composed [illegible] exhausted leaves, similar to what you have a sample of; the colouring matter [illegible] indigo and Dutch pink; the bloom is French chalk. I steamed the exhauste[illegible] leaves, and then added the colouring until a quantity sufficient to coat the su[illegible]face of the leaves had been taken up, after which I added finely-powder[illegible] French chalk, and mixed the whole well together, and then sifted to get rid [illegible] the surplus powder."

Nevertheless, science is equal to the discovery of this as well as most of t[illegible] frauds practised on articles of food. It is not alone sufficient, however, [illegible] mine that the leaves are artificially coloured, for this colouring, as we have dy seen, may have been the work of Chinese and not British fabricators. he first place, the form of the dried leaves should be particularly noticed; ese want the characteristic twist — if they be broken and agglutinated into masses of irregular shape — there will be reason to suspect that the tea is ious. Having noticed these particulars, the leaves should then be washed minute or so in cold distilled water, and quickly re-dried, when, if they ar glossy, it is probable that they consist of exhausted tea-leaves made up gum, a view which will be either dispelled or confirmed by chemical ana-, and by which the amount of gum and tannin must be determined. But purious green tea may consist of other leaves than those of tea, these being en into pieces and made up with catechu. In this case the deception may ore readily detected; the fragments or particles of the tea will be still more ular in size, and a close examination of them will show that they have not haracter of leaves at all, but are heavy and solid, resembling some resinous ance broken up; moreover the catechu in them may be discovered, either e taste or by soaking the fragments in cold water, when they will fall to s, disclosing minute pieces of the leaves used, and which may be identified the microscope, the water at the same time acquiring a deep reddish-brown r, and possessing the flavour of catechu.

e fabrication of spurious black and green tea is usually carried on in the factory, at the same time; the latter, in consequence of the closeness of mitation, being made in larger quantities than the former. For these less and in many cases pernicious, and even poisonous articles, we learn Mr. Phillips that the prices given by the dealers is from 1*s.* 8*d.* to 2*s.* per the black, and from 1*s.* 10*d.* to 2*s.* 6*d.* for the green, the appearance of the governing the price.

e following analyses of samples of spurious green tea seized by the Excise the last few years, have been furnished us by Mr. Phillips: —

Seized in London, 24th August, 1843.

	Green Tea.
Lignin	81·9
Gum	13·4
Colouring and Tannin	4·7
	100·0

Seized May 12th, 1843.

	A. *Green Tea.*	*B.* *Green Tea.*
Lignin	84·9	87·5
Gum	6·8	4·8
Tannin and colouring matter	1·1	0·6
Carbonate of lime	4·0	3·6
Carbonate of copper	3·2	3·5
	100·0	100·0

e leaves in these samples were black tea-leaves that had been exhausted, ied, and coloured to imitate green. The carbonate of lime was combined a vegetable yellow dye, forming a substance analogous to Dutch pink. was mixed with carbonate of copper, which produced a green colour, and this poisonous matter the tea was coated.

Seized 15th May, 1843.

	A. *Green Tea.*	*B.* *Green Tea.*
Lignin	84·0	71·5
Gum	11·4	12·0
Tannin and colouring matter	0·8	14·6
Carbonate of lime, vegetable yellow dye, and Prussian blue	3·8	1·9
	100·0	100·0

A was exhausted black and green tea-leaves, re-dried, and made up gum, and coloured to represent green with Prussian blue and a yellow w was similar to Dutch pink. B contained forty-four per cent. of A., and fi six per cent. of an inferior genuine green tea.

Seized June 1st, 1843.

	A. *Green Tea.*	B. *Green Tea.*
Lignin	86·5	86·6
Gum	5·4	5·6
Tannin and colouring matter	0·9	0·8
Carbonate of lime, Prussian blue, and a vegetable yellow dye	7·2	7·0
	100·0	100·0

These samples were composed of exhausted black and green tea-leaves, m up with gum, Dutch pink, and Prussian blue, to represent green tea.

Seized June 20th, 1843.

	Green Tea.
Lignin	86·9
Gum	7·0
Tannin and colouring matter	0·6
Carbonate of lime, Prussian blue, and a vegetable yellow dye	5·5
	100·0

This sample consisted of exhausted black and green tea-leaves, re-dried, adulterated with gum, Dutch pink, and Prussian blue, to represent green te

Seized in Manchester, June 19th, 1845.

This seizure comprised three samples of tea that were grossly adulte with Prussian blue, bichromate of potash, carbonate of lime, carbonate of nesia, and French chalk.

The adulteration was not less than fifteen per cent.

The following articles were also seized of the same party: —

Chromate of potash, }
Bichromate of potash, } Mixed together.
Carbonate of lime, }
French chalk.
Carbonate of magnesia.
Prussian blue.

Seized in Manchester, Feb. 16th, 1848.

No. 1.

CANTON IMPERIAL.

This tea is really a black tea that has been faced or glazed green, prior t blooming process; it also contains sand as an adulteration. 100 grains ga

Salts and earth	17·0
Sand	8·6
	26·6

No. 2.

SIFTINGS OF GREEN TEA.

This sample is chiefly black tea coloured to represent green; it is la adulterated with sand and earth. 100 grains gave—

Salts and earth	14·8
Sand	19·2
	34·0

No. 3.

SCENTED CAPER.

sample was seized as the tea had been faced and bloomed. 100 grains

Salts and earth	10·0
Sand	1·2
	11·2

pare the above with the following: —

No. 4.

GENUINE SCENTED CAPER.

grains gave —

Salts and earth	5·0
Sand	0·6
	5·6

re were also seized of this party the following articles: —

— A mixture of chromate of lead and carbonate of lime.
— Arsenite of copper.
— A mixture of indigo, chromate of lead, and carbonate of lime.
— A mixture of arsenite of copper, carbonate of magnesia, and Venetian

No. 5.

GENUINE BOHEA.

grains of the common kind of this description of tea yield from 5·5 to 5·8 nt. of ash, consisting of salts, earth, and silica, sometimes to the extent of wo to four tenths per cent

No. 6.

GENUINE GREEN TEA.

following analysis was made from a sample of green tea prepared and actured by Mr. Phillips himself: —

Lignin	55·3
Gum	5·4
Tannin and albumen	37·1
Colouring matter	2·2
	100·0

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ay facilitate the researches of others, if, before giving the analyses, we out briefly the more simple methods to be adopted for determining whether ple of tea be artificially coloured or not.

this purpose, if the leaves be coated to any considerable extent, it will be nt simply to view one or two of them as opaque objects, with a glass of ch focus, when the colouring matters entering into the composition of the will be detected as minute specks or particles, each reflecting its appro- tint.

ther method of determining the same point is to scrape gently the surface or three of the leaves with a penknife, when, if they be faced, the colour- atters may be detected in the powder thus separated, viewed as an opaque

hird method is to place five or six leaves on a slip of glass, moistening ith a few drops of water, and, after the leaves have become softened, squeezing the water out between the finger and thumb; this will then be to contain more or less of the ingredients forming the facing, should such een employed.

should it be desired to obtain the results on a large scale, half an ounce f the leaves may be agitated in a little water for a few minutes; this will much of the facing, without unfolding the leaves, and after a time the will collect as a sediment at the bottom of the vessel.

Lastly, the tea-dust, more or less of which is present in nearly every of tea, is usually found to contain the ingredients used in the facing in co able quantity, and from its examination satisfactory results may in gen very readily obtained.

Having by one or other of the above processes determined whether the of tea be faced, the next step is to ascertain the nature of the substanc for this purpose.

The blue colouring matter has generally been found to be either Prussi or indigo, most frequently the former. Ferrocyanide of iron or Prussian recognised under the microscope by the angular form of the fragments, their brilliant and transparent blue colour, but most decidedly by the ac liquor potassæ, which quickly destroys the blue, turning the fragments o reddish-brown colour. This re-agent may be easily applied to the s particles of Prussian blue under the microscope. Indigo is distinguished the same circumstances by the irregular form of the particles, their gr texture, and greenish-blue tint, but chiefly by the fact that the colour is stroyed by liquor potassæ. These blue pigments may, however, readily tained in sufficient quantity to allow of complete chemical analysis.

The yellow dyes commonly used are turmeric powder and Dutch pin first of these is at once recognised by its microscopic characters, which h previous occasions been fully described; and the latter, by the action of potassæ and acetic acid: the one re-agent converts the bright-yellow dark-brown, and the other occasions effervescence, — results explained fact that Dutch pink consists of a vegetable yellow, in combination wit or carbonate of lime.

The white powders used are usually kaolin, soap-stone, or sulphate of and although some clue may be obtained as to which of these is emplo any particular sample of tea, by the appearance of the leaves and the scopic characters of the powder, yet, in order to obtain decided result necessary to institute a chemical analysis.

The methods of detecting other substances occasionally used in the col of green tea, inasmuch as they are not commonly employed, it is unne in this place to detail.

For many of the samples of which we now give the analyses, our a ledgments are due to Mr. Bland, the writer of several interesting arti "Tea," and "The Tea Trade," published in the *Merchant*.

RESULTS OF THE MICROSCOPICAL AND CHEMICAL ANALYSES OF THIRT PLES OF GREEN TEA, AS IMPORTED INTO THIS COUNTRY FROM CHIN

No. 1.

COMMON TWANKAY.

Adulterated — Leaves of a dark-bluish, coppery-green colour, very faced with *Prussian blue* or *ferro-cyanide of iron*, and a small quanti *white powder*. The tea-dust contained an admixture of the same sub in larger quantity, and in a more obvious form.

No. 2.

TWANKAY.

Adulterated — Leaves of a dark-bluish, coppery-green colour, very dyed with *Prussian blue* and a small quantity of *the white* and *tu powders*. The tea-dust contained the same substances in particles enough to be visible to the naked eye. Intermixed with the leaves we tected *fragments of seed-vessels, seeds, rice*, as well as *other substan* nature of which did not admit of being determined, but all of whic artificially faced in the same manner as the tea-leaves themselves.

No. 3.

TWANKAY.

Adulterated — Leaves much broken, of a dull tawny-green colour, aced with *Prussian blue, turmeric*, and *a white powder*. Tea-dust ned the above ingredients in considerable quantity, and plainly vis e naked eye.

No. 4.

Good Common Hyson.

rated — Leaves bluish-green, highly dyed with ***Prussian blue***, and a
l quantity of a *white powder*, *China clay*, or ***kaolin***. The dust con-
d a large quantity of Prussian blue, remarkable for its colour, which
deep as to cause it to appear almost black under the microscope.

No. 5.

Common Hyson.

rated — Leaves of a dull bluish coppery-green colour, highly faced
Prussian blue and a very small quantity of ***kaolin***.

No. 6.

Common Young Hyson.

rated — Leaves much broken, and of a greyish-blue colour, being
ly coated with ***Prussian blue*** and *China clay*. The dust contained frag-
s of *mica*, probably derived from the kaolin in addition to the above
dients, all visible to the naked eye.

No. 7.

Fine Young Hyson.

rated — Leaves of a greyish-black colour, tinged only with green, and
tly faced with ***Prussian blue*** and a very small quantity of ***kaolin***.

No. 8.

Fine Hyson.

ated — Leaves of a yellowish-green colour, slightly faced with ***Prus-***
blue and a very small quantity of ***kaolin***.

No. 9.

Hyson.

ated — Leaves of a dull yellowish-green colour, faced with ***Prussian***
and a small quantity of *China clay*. The dust contained particles of
and much Prussian blue, both visible to the naked eye.

No. 10.

Young Hyson.

Really Woping Tea prepared to imitate " Young Hyson."

ated — Leaves of a dark and dull bluish-green colour, dyed with ***Prussian***
nd a small quantity of *turmeric powder*.

No. 11.

Young Hyson.

Ankoi Tea prepared for " Young Hyson."

ated — Leaves twisted, wiry, glossy, and of a greyish-blue colour, faced
Prussian blue, *turmeric powder*, and *China clay*.

No. 12.

Finest Young Hyson.

ated — Leaves of a greyish and obscure green colour, faced with a small
ity of ***Prussian blue*** and a very little *China clay*.

No. 13.

Very Fine Hyson.

ted — Leaves of an obscure yellowish-green colour, slightly faced
Prussian blue and a very small quantity of *turmeric powder* and *China*

No. 14.

Fine Cowslip Hyson.

ted — Leaves of an obscure greyish-green colour, faced with ***Prussian*** [illegible] The first contained a con- [illegible] of the latter.

No. [illegible]

[illegible]

[illegible] — [illegible] highly faced with [illegible] *Prussian blue*, a [illegible] The [illegible] largely admixed with the whi [illegible]

No. [illegible]

[illegible] Gunpowder

[illegible] — [illegible] highly faced with *Pr* [illegible] *powder.*

No. [illegible]

[illegible]

[illegible] — [illegible] highly faced in [illegible] *Prussian blue*, the [illegible]

No. [illegible]

[illegible] Gunpowder.

[illegible] — [illegible] coated with *Pru* [illegible] in addition to w [illegible] fragments of [illegible] *husk*, agglutin [illegible] shaped so as to resemble the fragment [illegible] these masses were also faced with the [illegible] surfaces particles of [illegible] The tea-dust contained much Prussian blue, [illegible]

No. [illegible]

Gunpowder

[illegible] *Tea.*

A [illegible] — [illegible] of a tarry-blue colour, and faced [illegible] and a small quantity of *turmeric.* [illegible] with fragments of leaves, not [illegible] particles, of the *same le* [illegible] and faced with the same substanc

[illegible] silk-worm is sometimes pre [illegible] our first impression on the discove [illegible] that the particles of leaves contained in them [illegible] and that we had really lighted upon a sample of [illegible] further examination, however, showed that the fragment [illegible] leaves of the tree referred to.

Figures [illegible] show the structure of the foreign leaves detected in sample; it will be seen how very much they differ from those of tea.

No. 20.

Gunpowder.

Adulterated — Leaves of a greyish-green colour, faced with *Prussian blue*, *meal-powder*, and the *white powder*, the same substances being c visible in the tea-dust.

No. 21.

Very Fine Gunpowder.

Adulterated — Leaves of a greyish and obscure green colour, faced with *sian blue* and a small quantity of the *white powder.*

No. 22.

GUNPOWDER.

ated — This article consists entirely of little masses of a dull grey
r, formed of *tea-dust* and *sand*, made up with *gum*, and faced with
ian blue, the *white powder*, and *turmeric-powder*, the masses exhibiting
ionally upon their surfaces particles of *mica;* these substances were more
y detected in large quantities in the fine dust found at the bottom of the
e. This spurious, or *Lie tea*, was sold in the market at 8*d.* per pound,
as purchased for exportation.

No. 23.

COMMON GUNPOWDER.

ated — This sample resembles in every respect the preceding.

No. 24.

GUNPOWDER.

ated — This article is of the same composition as the two previous ones,
ffers in colour, it being of a greener tint, and in the small size of the
s, these not being larger than mustard-seeds; the dust contains a con-
ble quantity of each of the three substances used in the facing.

No. 25.

GUNPOWDER.

Overland Sample.

ated — Of the same composition as numbers 22, 23, and 24, but the
s are several times larger than those of the previous sample, and are of
t greyish and agreeable blue colour. The quantity of China clay, Prus-
lue, and turmeric which enters into the composition of the facing is
lerable; and each of these substances was found in large quantity in
ist.

No. 26.

GUNPOWDER.

ated — Composition the same as that of the four previous samples.

No. 27.

IMPERIAL.

ated — Leaves of a deep bluish coppery-green colour, rather highly
with *Prussian blue*, and a small quantity of *turmeric powder* and the
powder.

No. 28.

UNGLAZED YOUNG HYSON.

"*Shanghai.*"

ated — Leaves of a dull, obscure, yellowish-green colour, faced with
and a small quantity of a white powder, probably *China clay*.

No. 29.

UNGLAZED HYSON.

ated — Leaves of an obscure green colour, faced with *Prussian blue*,
small quantity of the *white powder*. The dust contained particles of
isible to the naked eye, and a large quantity of Prussian blue, with only
China clay.

No. 30.

UNGLAZED GUNPOWDER.

"*Shanghai.*"

ted — Leaves of a yellowish-green colour, rather highly faced with
and a small quantity of the *white powder*.

Results of the Microscopical and Chemical Examination of S of Tea, as imported from Assam and Java, and of Briti Indian Growth and Manufacture.

No. 31.

Assam Twankay.

Genuine.—Leaves forming masses of very large size and irregular sh a yellowish-brown colour, and bearing no resemblance whatever to o green tea: there were detected in the dust a small quantity of *sand,* particles of *Prussian blue,* with four or five *turmeric-cells,* the pres all of which was, in all probability, accidental; this, therefore, is t sample of so-called green tea which has been found to be free fro facing.

No. 32.

Young Assam Hyson.

Genuine.—Leaves much broken, some black, but the greater part of a ish-brown colour, and all without facing of any description; this like the preceding, is very dissimilar in appearance to green tea.

No. 33.

Java Gunpowder.

Adulterated.—Leaves rolled and agglutinated into spherical masses o the size and colour of whole black pepper, but in no respect res green tea, and slightly faced with a white powder, probably *kaolin* were detected in the dust a few particles of *mica* and a small quantity white powder, fragments of mica being occasionally visible on the of the masses themselves.

Results of the Microscopical and Chemical Analyses of Sam Spurious Green Teas of British Fabrication.

Seized by the Excise, July, 1851.

No. 34.

Analysis.—Leaves misshapen, broken, of a bluish-black colour, an with *Prussian blue* and *French chalk.* Infusion very pale.

No. 35.

Analysis.—Leaves of a dull, greyish-green colour, some of them being and presenting the twisted form of genuine tea; others broken an shapen: the former, on analysis, are ascertained to be faced with *P blue, turmeric,* and *kaolin*: and the latter with *Prussian blue, Chin clay,* and *soap-stone.*

From the form of the leaves, and the nature of the ingredients used facing, it is evident that this sample consists in part of *unused green te* pared and faced in China, and in part of *exhausted tea-leaves,* colour made up in this country in imitation of green tea.

No. 36.

Analysis.—This article consists of little masses, irregular in size and for greenish hue, and bearing a general resemblance to sample 22 and fo lowing samples. The masses consist of broken fragments of leaves, m with *catechu,* and faced with *indigo,* the leaves being those of the *sy* and *horse-chesnut.*

For the above specimen, we are indebted to Dr. Muspratt. It is one articles, of some of which we gave analyses in a former Report, manufa by J. Stevens, of Liverpool, on whose premises a seizure of spurious t made by the Excise in December, 1850.

The following conclusions may be deduced from an examination of the ana- es of Green Tea, as imported into this country from China:—

That the *whole* of the *thirty samples* were adulterated.

d. That *five* of the samples called gunpowder, consisted of *Lie tea*—that is, of *tea-dust* and *sand*, made up with *rice-water*.

That *one* of the samples was composed in part of *paddy-husk* and *other ubstances*.

That *another* sample was composed chiefly of *Lie tea* made up in part with *ther leaves* than those of tea.

That *another* sample consisted principally of *Lie tea*.

That the *whole* of the samples were artificially *glazed* or *coloured*.

That this *glazing* or *colouring* consisted of two, and in some cases three, ubstances—a *blue*, a *yellow*, and a *white*. The *blue* colouring matter was resent in *all* the samples, and in *twenty-eight* it was ascertained to be *Prussian lue*, and in the other *two*, *indigo*; the *yellow* was detected in *seventeen* sam- les, and consisted in all instances of *turmeric powder*; the *white* was observed *twenty-nine* samples, and in general consisted of *China clay* or *kaolin*.

That in *no one* of the samples was a *single leaf possessed of a green colour ot produced by artificial means* detected, from which strong fact, notwithanding a certain amount of evidence to the contrary, we are almost led to onclude that there is really no such thing as a "*genuine green tea*" of the olour ordinarily supposed to be characteristic of that kind of tea. The leaves, hen deprived of their artificial coating, have invariably presented different hades of yellow, olive, brown, and even black.

the numerous examinations which we have made of samples of tea as im- ed into this country, the only evidence derived from personal observation ch we have been able to obtain of the existence of tea-leaves of *a natural n colour*, is the occasional occurrence in several samples of *Oolong*, a black of leaves, which, after infusion, presented a bright and coppery bluish-green ur.

rom an examination of the three samples of *Assam* and *Java* tea submitted nalysis, it appears —

That *two* of the samples — viz., those from *Assam*, were *genuine*, while the *ava* specimen was slightly faced with a *white powder*.

That the teas forming these samples were of a dull yellowish colour, *with- t the slightest tinge of green*, resembling, in fact, the leaves of the adulter- ed samples of green tea imported from China, when deprived of their ing.

astly, it is apparent from the Third Table of Analyses —

hat British fabricators of spurious tea are *but little behind* the Chinese in the nfacture of imitation green tea, which, as we have seen, they can prepare er from exhausted tea-leaves or from any other leaves (the kind matters not) ch may be picked up by the hedge-side, or in the wood.

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ults of the Microscopical and Chemical Analyses of Twenty amples of Green Tea, purchased of Grocers and Tea-Dealers resi- ent in the Metropolis.

will be remembered that we have already given numerous analyses of ly every known kind of green tea, as imported into this country. We now to complete our investigations, and to make known the results of the s of samples as actually supplied to the consumer.

No. 1.

Hyson.

sed of J. Walton, 129. Bishopsgate-street Without.

terated—Leaves of a dark-green colour, somewhat broken, faced with

Prussian blue, a little *turmeric-powder*, and the *white powder*. Th contains much Prussian blue and China clay, with a little turmeric o

No. 2.

YOUNG HYSON.

Purchased of G. F. Back, 128. Tottenham-court-road.

Adulterated — Leaves of a dark bluish-green colour, faced with P *blue* and the *white powder*.

No. 3.

HYSON.

Purchased of A. Andrews and Co , 57. Tottenham-court-road.

Adulterated - Leaves of a greyish-green colour, much broken, with siderable quantity of dust, all highly faced with much *Prussian bl* small quantity of *turmeric-powder* and the *white powder*.

No. 4.

HYSON.

Purchased of G. Clark, 185. Tottenham-court-road.

Adulterated - Leaves of a yellowish-green colour, a good deal brok a large quantity of dust, all highly glazed with *Prussian blue* and quantity of the *white powder*.

No. 5.

HYSON.

Purchased of Pembridge and Hunt, 107. Tottenham-court-road.

Adulterated Leaves of a dull-green colour, not much broken, gla much *Prussian blue*, and only a very small quantity of the *whit* and *turmeric-powder*.

No. 6.

DELICIOUS HYSON.

Purchased of M. Bousefield, 111. Tottenham-court-road.

Adulterated — Leaves of a greyish-green colour, rather glossy, glaz *Prussian blue*, *turmeric-powder*, and the *white powder*.

No. 7.

HYSON.

Purchased of J. Rose, 288. High-street, Shoreditch.

Adulterated — Leaves of a dull greyish-green colour, highly coat *Prussian blue*, the *white powder*, and a little *turmeric-powder*.

No. 8.

GUNPOWDER.

Purchased of J. Butterworth, 110. High-street, Shoreditch.

Adulterated — Composed in part of tea-leaves, and partly of LIE TEA as already explained, consists, when not otherwise adulterated, masses (made up with *rice-water*) of *tea-dust* and *sand*, the lea masses all being highly glazed with *Prussian blue*, *turmeric-pow* *China clay*, and the dust containing these ingredients in quantity as sometimes to be visible to the naked eye.

No. 9.

GUNPOWDER.

Purchased of G. B. White, 147. Shoreditch.

Adulterated — This sample consists almost entirely of LIE TEA, highl with *Prussian blue*, *turmeric-powder*, and the *white powder*, as particles of *mica*, all of which are visible to the naked eye in the du

This article, as tea, is all but worthless, and in consequence of the e which it is glazed with Prussian blue is calculated to prove, in som injurious to health.

No. 10.

Gunpowder.

urchased of J. Clark, 175. Shoreditch.

Adulterated — Leaves of a slaty-green colour, consisting in part of tea-leaves, and partly of Lie tea, both being faced with *Prussian blue*, *turmeric-powder*, and the *white powder*, these ingredients being visible in the dust to the naked eye.

No. 11.

Gunpowder.

urchased of J. Pringle, Shoreditch.

Adulterated — Leaves of a greyish-green colour, somewhat glossy, admixed with a small quantity of Lie tea, both being highly coated with *Prussian blue*, *turmeric-powder*, and the *white powder*, all visible in the dust to the naked eye.

No. 12.

Gunpowder.

urchased of G. W. Back, Mile-end-road.

Adulterated— Leaves of a slaty-green colour, somewhat glossy, and glazed with much *Prussian blue*, a little *turmeric-powder*, and the *white powder;* the sample was also adulterated with a small quantity of Lie tea, coloured with the same substances.

No. 13.

Pearl Leaf Gunpowder.

urchased of J. Clark, 8. Clare-street, Clare-market.

Adulterated — Leaves of a dark, coppery-green colour, and admixed with a small quantity of Lie tea, both being thickly painted with *Prussian blue* and a small quantity of *turmeric-powder*, which, together with a considerable quantity of *starch-granules* of small size, were likewise present in the dust; the Prussian blue was remarkable for its deep colour.

No. 14.

Gunpowder.

urchased of C. Belsham, 120. Drury-lane.

Adulterated — Leaves of a greyish, obscure green colour, and admixed with much Lie tea, both being faced with *Prussian blue*, *turmeric-powder*, and the *white powder*.

No. 15.

Gunpowder.

urchased of Hawthorn and Co., 38. Tottenham-court-road.

Adulterated — Leaves of a greyish, obscure green colour, somewhat glossy, containing a few pieces of *paddy-husk*, and admixed with a considerable quantity of Lie tea, all being faced with *Prussian blue*, *turmeric*, and the *white powder;* these ingredients being also plainly visible in the dust to the naked eye.

No. 16.

Gunpowder.

urchased of Salmon and Co., 69. Tottenham-court-road.

Adulterated — Leaves of a decided green colour, glossy, highly faced with *Prussian blue*, *turmeric-powder*, and a little of the *white powder*.

No. 17.

Gunpowder.

urchased of J. Stanbury, 2. Portman-place, Edgware-road.

Adulterated — Leaves of a greyish-green colour, glossy, faced with *Prussian blue*, the *white powder*, and a little *turmeric*.

No. 18.

GUNPOWDER.

Purchased of Bodley and Co., 5, Portman-place, Edgware-road.

Adulterated: — Leaves of a green colour, largely admixed with LIE TEA, bo being faced with *turmeric-powder*, the *white powder*, and *Prussian bl* the first two being visible in the dust to the naked eye.

No. 19.

CHOICE GUNPOWDER.

Purchased of Martin and Co., 147, Edgware-road.

Adulterated: — Leaves of a grey-green colour, but more than half of th article consists of LIE TEA, both being faced with *Prussian blue*, *turmeric powder*, and the *white powder*.

No. 20.

GUNPOWDER.

Purchased of J. M. Stubbs, 140, Edgware-road.

Adulterated: — Nearly the whole of this article consists of LIE TEA, the mas of which are thickly coated with *Prussian blue*, *turmeric-powder*, and th white powder, most probably *China clay*, much of each of which is visib in the dust to the naked eye.

ON THE ADULTERATION OF TEA BY THE CHINESE WITH LEAVES OTHER TH THOSE OF THE TEA-PLANT.

It will be recollected that in a previous portion of this former Report quoted a statement by Dr. Dickson, that the Chinese annually gathered dried millions of pounds of leaves not those of tea, to be used in the adulterat of that article.

It will also be remembered, that in the analysis, already given, of a sample gunpowder (*Hyson tea*), we stated that we had discovered portions of lea presenting a very different structure from those of tea: the statement made Dr. Dickson, as well as the discovery referred to, have induced us to instit further investigations on a subject of so much importance.

We have therefore submitted the leaves of four different samples of tea, tea quality, as imported into this country from China, to careful microsco examination, and with the following results: —

The first was the "*Gunpowder*" already referred to; in this we detec fragments, not only of the leaf first noticed, but also those of a second leaf, tea, and likewise possessing a very distinct organisation. The tea in questi consisted in part of leaves, and partly of Lie tea. Now these foreign lea formed not only the greater portion of the loose leaves, but also entered larg into the composition of the little masses of which Lie tea is constituted, scarc a particle of the tea-leaf itself having been observed in the sample.

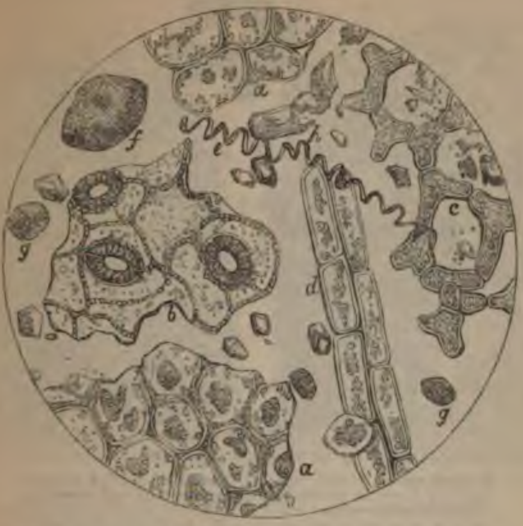
The structure of these leaves is shown in the two following figures. (*Fi* 98. and 99.)

A sample of "*Lie tea*," admixed with a few small fragments of leaves, found to consist principally of portions of the same leaf, much broken up, as represented in *fig.* 99. We may remark that it is customary, in order the m effectually to aid deception, to mix with Lie tea a certain quantity of broken or other leaves.

In a sample of *Twankay* we detected, in addition to tea, the leaves of th other species of plants, two of which we identified, the one as *Camellia Sasan* the other as a kind of *plum*: these are represented in *figs.* 100. and 101.

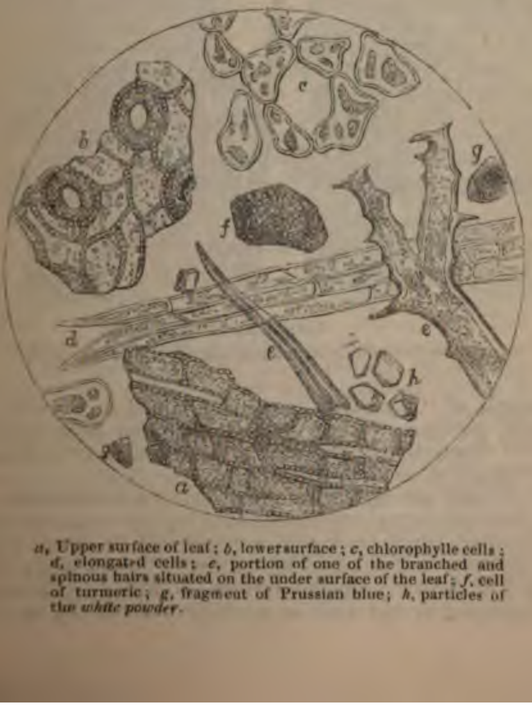
FOREIGN LEAVES IN TEA.

Fig. 98.



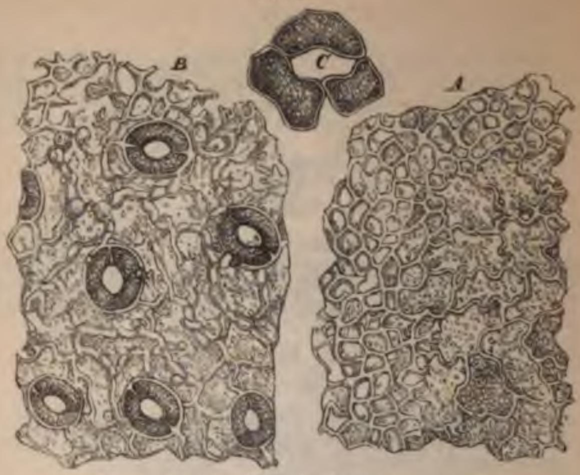
a, Upper surface of leaf; *b*, lower-surface, showing the cells with their slightly-beaded margins, of which it is composed; *c*, chlorophylle cells, so disposed as to form very large areolæ; *d*, elongated cells found on upper surface of the leaf in the course of the veins; *e*, spiral vessel; *f*, cell of turmeric; *g*, fragment of Prussian blue; *h*, particles of the white powder, probably *China Clay*.

Fig. 99.



a, Upper surface of leaf; *b*, lower surface; *c*, chlorophylle cells; *d*, elongated cells; *e*, portion of one of the branched and spinous hairs situated on the under surface of the leaf; *f*, cell of turmeric; *g*, fragment of Prussian blue; *h*, particles of the *white powder*.

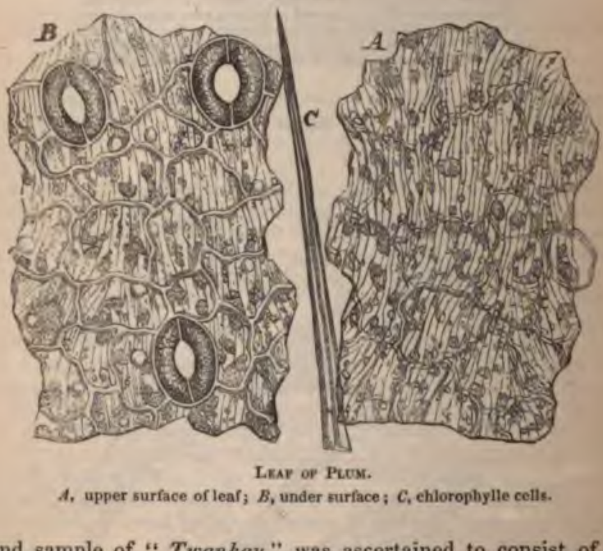
Fig. 100.



LEAF OF CAMELLIA SASANQUA.

A, upper surface of leaf, showing the cells of which it is composed; *B*, under surface, exhibiting its cells and stomata; *C*, chlorophylle cells.

Fig. 101.



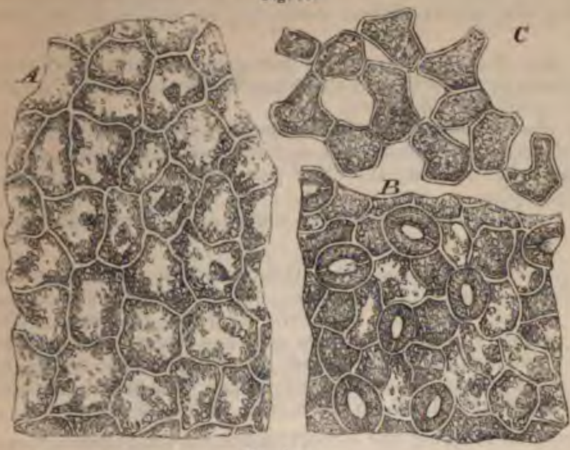
LEAF OF PLUM.

A, upper surface of leaf; *B*, under surface; *C*, chlorophylle cells.

A second sample of "*Twankay*" was ascertained to consist of tea m with paddy-husk, portions of seed-vessels, and other substances, the le being of a coarse description, and wanting the peculiar twist characterist the more carefully prepared kinds of tea.

Between the *old* and *young* tea-leaf there exists a considerable differen structure: we have already given figures showing the organisation of the as met with in most black teas, and we now add to those another fig exhibiting the characters of the leaf in a more advanced stage of its gro On comparing this figure with the former, it will be observed that *differences* are very great, and such as might be referred by an inexperie observer to even distinct leaves, and on this account we have deemed it desirable to give an additional drawing.

Fig. 102



Tea-Leaf.

A, upper surface of fully-developed leaf, representing the cells of which it is constituted; *B*, under surface, showing its cells and stomata; *C*, chlorophylle cells.

The above four analyses alone clearly prove that the Chinese do adulterate some of their teas, more particularly certain green teas, and especially the spurious article denominated Lie tea, with leaves other than those of tea.

On a future occasion we propose to make an extended examination of numerous samples of tea, as imported into this country, in order that we may be the better able to judge of the extent to which this scandalous fraud is carried.

In examining different kinds of leaves with the microscope, one cannot fail to be struck with the very great resemblance which these organs bear in organisation, as well as in function, to the lungs of animals. The mesophylle consists of cells, denominated chlorophylle cells, which contain the colouring matter of the leaf, chlorophylle; these cells are united together at certain points only, so as to leave a number of areolar spaces, analogous to the air-cells of the lung, and which communicate with each other, one of these spaces of large size being always situated opposite each of the stomata; by this arrangement a free circulation of air throughout the whole tissue of the leaf is effectually ensured.

British Tea.

Some years since an article was prepared bearing the above name, under the sanction and protection of a *patent;* it was composed chiefly of *sloe leaves*, as well as those of the *elm*, *apple*, *rose*, *poplar*, *willow*, &c. This so-called tea, when manufactured, was sold clandestinely to tea-dealers, and mixed with genuine tea. This having come to the knowledge of the excise authorities, several seizures of the worthless stuff were made at various tea-dealers, and ample proof having been obtained that the article was employed solely for the purpose of adulteration, the stock in the possession of the manufacturer was seized and publicly destroyed in the yard of the Excise office.

This seizure, we believe, was effected on the 11th of October, 1833, and an account of it is to be found in the *Times* of October 12, 1833.

That the government of the day laying claim to integrity, or even common sense, should legalise the adulteration of coffee by permitting it to be admixed with that worthless root, chicory, is truly surprising, but the case of public authorities granting a patent for the manufacture of an article, such as British tea, utterly valueless in itself, and which could only be employed to adulterate genuine tea, the public and the revenue being defrauded thereby, is indeed an act of still greater folly and culpability.

Returning now to the Table of Analyses of the samples purchased of dealers, and reviewing the results therein contained, we arrive at the following conclusions: —

1st. That the whole of the *twenty* samples of green tea were artificially coloured, glazed, or painted, with a mixture of *Prussian blue*, *turmeric*, and a *white powder*, probably *China clay*.

2nd. That *eleven* out of the *thirteen* gunpowder teas, in addition to being artificially coloured, were adulterated with different proportions of *Lie tea*; this article in some cases forming the chief part, and in other instances nearly the whole of the samples.

3rd. That out of the *twenty* samples, *not one* was found which possessed the *natural* green colour.

We have already repeatedly given the composition of Lie tea, from which it appears that it is not only worthless, but, in consequence of the extent to which it is glazed, calculated to prove injurious to health. The price of this article, exclusive of duty, is from sixpence to eightpence per pound; and in the country from which it is exported, it probably would not fetch one penny per pound. That persons should be made to pay for a pound of such deleterious rubbish, four shillings of hard-earned money, is indeed disgraceful.

We will now, on bringing our Report on tea, for the present, to a conclusion, recapitulate the more important results arrived at in the course of our investigations.

The chief points ascertained with regard to *Black tea* are —

1st. That the principal black teas—namely, the Congous and Souchongs, arrive in this country, for the most part, in a genuine state.

2nd. That certain descriptions of black tea, as Scented Orange Pekoe and Caper, are invariably adulterated, the adulteration in general consisting in the glazing of the leaves with plumbago or black lead; the Caper likewise being subject to admixture with other substances, as paddy-husk, Lie tea, and leaves other than those of tea.

3rd. That several varieties of a spurious Caper, or black Gunpowder, are prepared, which consist of tea-dust, and sometimes the dust of other leaves, and sand, made up into little masses with gum, and faced or glazed with plumbago, Prussian blue, and turmeric-powder: in some cases these imitations are sold separately, but most frequently they are used to mix with and adulterate the better qualities of Caper — viz. those which are made of tea faced with plumbago only.

With respect to *Green tea* the principal conclusions are —

1st. That these teas, with the exception of a few of British growth and manufacture, from Assam, are invariably adulterated — that is to say, are glazed with colouring matters of different kinds.

2nd. That the colouring matters used are in general Prussian blue, turmeric-powder, and China clay, other ingredients being sometimes but not frequently employed.

3rd. That of these colouring matters, Prussian blue, or ferro-cyanide of iron, possesses properties calculated to affect health injuriously.

4th. That in this country there is really no such thing as a green tea—that is, a tea which possesses a natural green hue.

5th. That green teas, and more especially the Gunpowders, in addition to being faced and glazed, are more subject to adulteration in other ways than black teas, as by admixture with leaves not those of tea, with paddy-husk, and particularly with Lie tea.

6th. That Lie tea is prepared so as to resemble green tea and is extensively used by the Chinese themselves to adulterate gunpowder tea; it is also sent over to this country in vast quantities, and is employed for the same purpose by our *own tea-dealers* and grocers.

ve are the more important conclusions as to the condition of black teas as imported, but these articles undergo further deterioration country. Thus we have adduced evidence to show—

t exhausted tea-leaves are frequently made up with gum, &c., and re- e public as genuine black tea, and, when artificially coloured and en as green tea.

at the substances employed in the colouring are in many cases very e objectionable and injurious than those used by the Chinese, being ly poisonous.

at it is no uncommon thing for tea, both black and green, to be fabri- leaves not those of tea, and possessing no properties in common with of that plant.

at black Lie tea is often coloured and extensively employed by our own d grocers for the adulteration of green tea.

dulterations noticed, those practised by the Chinese are of course by st important, because they extend to a very considerable portion of the ned in this country; at the same time the frauds resorted to by our s must not be lost sight of.

g been shown, then, that there exists much that is wrong in connexion specially green tea, as imported into this country, it now remains for ider whether means cannot be devised by which these evils may to a nt be remedied.

ose, then, by way of remedy,—

eduction of duty on all descriptions of *black tea*, to the extent of at third, allowing it to remain the same as at present on every kind of

at all Lie tea, (notwithstanding that it sometimes contains a small f tea-dust, and pays the same duty as tea,) since it is invariably made with sand, as well as frequently leaves not those of tea, and as it is y for the purpose of adulteration, should, as soon as it falls under the the excise authorities, be confiscated and destroyed; similar steps o be adopted with those kinds of tea, whether black or green, which to be admixed with Lie tea.

fully persuaded that the before-mentioned reduction of duty on black extend the consumption of that useful and for the most part unadul- d of tea so largely, that in place of there being any *diminution* in the here would positively be an *increase* of income from this source, he dealers were not allowed, as is too frequently the case, to appro- difference.

hough not an absolute necessary of life, is an article of daily con- amongst a very large portion of the community; a still larger portion, rom the high price at which it is sold, are unable to procure one-sixth uch as they would gladly consume, were it but placed within their d we firmly believe, that were any considerable reduction of duty on nade, the consumption would very soon be doubled. This reduction, suaded, would not only increase the consumption without injury to e, but would effectually put a stop to much of the adulteration now nt, frequently to the detriment of health. The duty on green teas the same as at present, would do much to lessen their consumption.

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ommendation made in the above Report has since been acted upon, ty is now reduced.

at the old duty of 2*s*. 1*d*. per lb. and 5 per cent., the quantity entered consumption was 54,724,612 lbs.; in 1853, the duty being reduced to the 5th of April, it was 58,860,127 lbs.; in the *first six* months of 1854, being reduced on the 5th April to 1*s*. 6*d*., the quantity entered for umption was 30,926,294 lbs.; on the 5th April, 1855, the duty will be duced to 1*s*. 3*d*. per lb.; and on 5th April, 1856, to 1*s*. per lb., and so

Another good effect of the publication of these Reports, and one whi
scarcely have been looked for, is, that the Chinese themselves have
give up, to some extent, the practice of colouring or glazing their gr
and now not unfrequently send to this country chests of uncoloured g
even branded on the outside with the words "Uncoloured Tea." For
ledge of this fact we are indebted to Mr. Bland, whose letter we publis

To the Editor of THE LANCET.

SIR, — In the course of my duty, inspecting arrivals, I have been p
notice many indications of the effects of your critical remarks on colo
dyed teas, now that New Crop Greens are in course of arrival, m
natural kinds being observable. Four or five classes have particularly
my attention, being purely unsophisticated both in manipulation and c
latter the hue of an ordinary green-glass bottle when broken thin. O
examination, I find that the inscription on the mat covering the chests
coloured Tea;" descriptive enough, perhaps, seeing that we have
English word to designate the desideratum. Should you wish it, I w
samples of these from the bonded warehouses, or accompany any agent
to see them there.

I am your obedient serva

Mark-lane, March, 1854.

W. J.

We are also indebted to Mr. Bland for numerous samples of the "U
Tea" referred to, of different kinds; these we have examined, and f
entirely free from colouring matter. The appearance of the sa
however, very different from that of ordinary and artificially colour
tea; the leaves are of a yellowish or olive-brown colour, rather than o
hue.

To the number of uncoloured green teas may be added the East In
known as Kumaon, in reference to which the following notice, in r
correspondent, appeared in the LANCET some time back:—

"The samples of black and green Kumaon tea are both of excelle
and quality; and we are happy to inform our correspondent that, unlik
green teas which we have ever met with imported from China, the
green tea is not in any way artificially coloured. This tea, although it
the flavour of ordinary green tea, differs very considerably from it i
ance, the leaves being of so dull and yellowish a tint, that in day-
article would scarcely be recognised as green tea at all. The teas of A
now rising considerably in value."

Subsequent to the publication of the above Report we received
author a paper, entitled "Observations on the Teas of Commerce
Warington, F.C.S. This communication was read before the Chemic
May 19th, 1851, and published in their Quarterly Journal for July, 1851
the head Adulteration and Sophistication of Teas we meet with the
observations: —

"ADULTERATION AND SOPHISTICATION OF TEAS.

"Since writing my former paper, several teas have come under m
which must be classed under this head. The first I shall mention is a
cation which has been carried on in this country to some extent, and
in giving the appearance of green tea to an imported black tea. The
used as the basis for this process of manufacture is a tea called scent
it is a small, closely-rolled black tea, about the size of small *gunpow*
when coloured, is vended under this latter denomination, the difference
between the scented caper and this fictitious gunpowder being about l
margin sufficient to induce the fraud. This manufacture has been ca
nderstand, at Manchester, and was kept as secret as possible; an
after considerable trouble that some of my friends succeeded in
different specimens for me, that could be fully depended on, as or
his manufactory. It appears that it is generally mixed with other tea

ve the parties testing it. How this manufacture was conducted, I am not
red to say; but some preparation of *copper* must have been employed, as
esence of that metal is readily detected in the specimens I received. I
e, however, that this sophistication has ceased.

have now to call your attention to another adulteration of the most flagrant
Two samples of tea, a black and a green, were lately put into my hands
nerchant for examination, the results of which he has allowed me to make
The black tea was styled *scented caper;* the green, *gunpowder;* and
erstand they are usually imported into this country in small chests called
packages. The appearance of these teas is remarkable; they are *appa-*
exceedingly closely rolled, and very heavy; the reasons for which will
arly demonstrated. They possess a very fragrant odour. The black tea
ompact granules, like shot of varying size, and presenting a fine glossy
of a *very black* hue. The green is also granular and compact, and pre-
a bright pale-bluish aspect, with a shade of green, and so highly glazed
ced, that the facing rises in clouds of dust when it is agitated or poured
one vessel to another; it even coats the vessels or paper on which it may
ured. On examining these samples, in the manner described in my former
, to remove this facing, I was struck by the tenacity with which it adhered
surface, and which I had never remarked in any previous sample, requir-
be soaked for some time in the water before it could be detached; with
recaution, however, the greater part of the facing material was removed.
ved, in the case of the sample of green tea, to be a pale Prussian blue, a
vegetable colour, which we now know to be turmeric, and a very large
rtion of sulphate of lime. The facing from the sample of black tea was
tly black in colour, and on examination was found to consist of earthy
ite or black lead. It was observed, that during the prolonged soaking
tion, to which these teas had been submitted, there was no tendency exhi-
in either case to unroll or expand, for a reason which will be presently
us. One of the samples was therefore treated with hot water, without
ver any portion of a leaf being rendered apparent. It increased in size
tly, was disintegrated, and then it was found that a large quantity of sand
lirt had subsided; this was separated by decantation, and collected; it was
l to amount to 1·5 grains from 10 grains of the sample, or 15 in the 100
It was evident, however, that much of the lighter particles must neces-
y have been lost in the process of decantation; a weighed quantity of the
le was therefore carefully calcined, until the ash was quite white, and the
e of the carbonaceous matter burnt off; it yielded a result equivalent to
on the 100 parts. During this operation also, no expansion or uncurling
e leaf, as is generally to be observed when heat is applied to a genuine
was seen; in fact, it was quite evident that there was *no leaf to uncurl*, the
e of the *tea* being in the form of dust. The question next presented itself
how these materials had been held together, and this was readily solved;
n examining the infusion resulting from the original soaking of the sample,
dant evidence of gum was exhibited.

he sample of green tea was of a precisely similar kind to the black; it
ed 4·55 grains of ash, &c. from 10 grains of the specimen, or 45·5 per cent.
ecimen of Java gunpowder yielded 5 per cent. of ash; so that we have in
ample 40·5 per cent. of dirt and sand over and above the weight of ash
ed by the incineration of a genuine tea.

hus we have then in these samples a mixture of tea-dust with dirt and sand,
tinated into a mass with a gummy matter, most probably manufactured
rice flour, then formed into granules of the desired size, and lastly dried
oloured, according to the kind required by the manufacturer, either with
lead, if for black tea; or with Prussian blue, gypsum, or turmeric, if in-
d for green.

ince examining these two samples, I have obtained through a friend another
men of green tea, having a very different appearance; that is, better ma-
tured, or rather, I should say, more likely to deceive the consumer, from
ing made to imitate an *unglazed tea.* It is of a yellowish-green colour,
ed and granulated as the former samples, and not much dusted; it yielded
r cent. of ash, sand, and dirt.

"On inquiry, I have learnt that about 750,000 lbs. weight of these teas h been imported into this country within the last eighteen months, their int duction being quite of modern origin; and I understand that attempts have b made to get them passed through the Customs as *manufactured goods*, and as teas; a title which they certainly richly merit, although it must be evid from a moment's consideration, that the revenue would doubtless be defrau inasmuch as the consumer would have to buy them as teas from the dealer. is to be feared, however, that a market for them is found elsewhere. The nese, it appears, will not sell them except as teas, and have the candour to cify them as *lie* teas; and if they are mixed with other teas of low quality, Chinese merchant gives a certificate, stating the proportion of the *lie tea* pr with the genuine leaf. This manufacture and mixing is evidently practise meet the price of the English merchant. In the case of the above samples, black is called by the Chinese, *lie flower caper*; the green, *lie gunpowder* average value is from 8*d*. to 1*s*. per lb. The brokers have adopted the cu term *gum and dust*, as applied to these lie teas or their mixtures, a cogno which at first I had some difficulty in understanding, from the rapid manne which the two first words were run together.

"I may subjoin the results obtained from the careful incineration of a va of teas, as they may be interesting, for the purpose of comparison, and illus the point I have mentioned as to these spurious teas being mixed with gen ones.

"Gunpowder tea, made in Java, gave 5·0 grains of ash in the 100 parts:

Gunpowder, during the East India Company's Charter	5·0
Kemaon hyson - - - -	6·5
Assam hyson - - - - -	6·0
Lie gunpowder, No. 1. - - - -	45·5
,, No. 2. - - - -	34·0
Scented caper - - - - -	5·5
Lie flower caper - - - -	37·5
Mixtures containing these lie teas, No. 1. - -	22·5
,, ,, No. 2. - -	11·0"

The investigations contained in the Report on Tea and its Adulterations made early in the spring of 1851, and the first part of the Report was publi in the LANCET of July, 1851.

MILK, AND ITS ADULTERATIONS.

MANY infants subsist entirely upon the milk of the cow; that nutritious also usually forms a large portion of the diet of most young children, and some shape or other, enters into the daily food of almost every adult; it th fore becomes a matter of primary importance to determine whether milk as plied for the consumption of the public, especially the inhabitants of this g city, is in a genuine state or not; and to this task we now propose to devote selves.

If the testimony of ordinary observers, and even of many scientific witne is to be credited, there are but few articles of food more liable to adulter and this of the grossest description, than milk.

The great value of these Reports on Food and its Adulterations consist the fact, that all the conclusions are based upon actual observation, the st ments made by other observers and writers seldom being accepted as cor without previous experiment; the result is, that, while we frequently ascer prevailing notions to be erroneous, we discover many new and unexpected fa The correction of an error is of no less importance than the discovery of a f We have reason to believe that the truth of the preceding remarks will bec remarkably evident in the course of the inquiries the particulars of which we now about to make known.

COMPOSITION AND ANALYSIS OF MILK.

Before proceeding to refer to the adulterations of milk, it will be proper to at of its composition.

From the fact that persons may be entirely sustained upon a diet of milk for indefinite period, it may be concluded that that fluid must contain all the elements necessary for the growth and sustenance of the human body, a view the rectness of which is fully established by chemical research.

Milk consists of water holding in solution casein, or cheese, sugar of milk, rious salts, and in suspension, fatty matter, in the form of myriads of semi- aque globules, to which the colour and opacity of milk is due.

Skim-milk, butter-milk, cream, butter, curds-and-whey, cream-cheese, and dinary cheese, are mere modifications of milk, differing only from each other her in the abstraction of one or more of its constituents, or else in the varia- n of their proportions.

Skim-milk.—The first of these (skim-milk) differs from ordinary milk in con- ning a less quantity of fatty matter, a portion of this having been removed th the cream; it still, however, contains nearly all the cheese, the sugar of lk, some butter, and the salts of milk: it is therefore scarcely less nutritious n new milk, but, in consequence of the diminished amount of fatty matter, is adapted to the development of fat, and to the maintenance of respiration the temperature of the body. In some cases where fatty matter is found disagree, and where, in consequence, milk in its usual state cannot be taken hout inconvenience, skim-milk may be substituted with advantage.

Butter-milk.—Butter-milk approaches skim-milk in its composition, but con- ns a still smaller quantity of fat; as an article of diet for poor persons, it has recommendation of cheapness.

Potatoes and butter-milk, as is well known, taken together, form a very con- erable portion of the diet of the peasantry of Ireland: the butter-milk con- utes an essential part of such a diet, it supplying the nitrogenized matter essary for the growth of the body, and of which the potatoes themselves are mparatively deficient.

Cream.—In contradistinction to these, cream consists almost entirely of the , with a very small quantity of casein and the other constituents of milk.

Butter.—Butter differs little from cream, but is more completely separated m the cheese, sugar, and salts; and the fat globules, in place of being free distinct, have all run together, so as to form a semi-solid substance.

Curds-and-Whey.—Curds-and-whey are made up of all the elements of milk, the form in which they exist is altered; the cheese is thrown down by net, or by the addition of an acid, as acetic acid, and in its descent, carries h it the greater part of the butter, the two together forming the curd; while whey, or serum, consists entirely of water, the sugar, and the salts.

Cream-Cheese.—Cream-cheese consists of the curd (that is, of the cheese butter), the greater part of the serum or whey being removed by slight essure.

Ordinary Cheese.—Ordinary cheese contains little or no butter, and is made her from pure or skim-milk, according to the quality: the casein is precipi- ed by rennet in the usual manner, and subjected to great pressure in moulds, *nato* being frequently added, to heighten its colour.

The relative proportions of the different constituents of cow's milk, especially fatty matter, are subject to very great variation: the age of the cow, the ne after calving, food, temperature, weather, and the time and frequency of lking, all occasion considerable differences.

Influence of Age on Milk.—With respect to age, a young cow with her first gives less milk than with her second, third, or fourth calf, she being consi- ed to be in her best condition, in most cases, when from four to seven years old.

The period during which cows give milk after calving is usually five or six nths, but very frequently the time is much prolonged beyond this; we have n informed of an instance of a cow continuing to give milk for three years a half after calving.

The first milk yielded by the cow after calving is yellow, thick and stringy: s called colostrum, and by milkmen and others, "beastings." This state of the milk lasts from about three weeks to a month, but is very ba the first ten days, during which time the milk is not fit for use. Fro end of the first to the termination of the third or fourth month, the n in its best condition.

The cow carries her calf for forty weeks, or ten lunar months: it is the mon practice to milk the cow regularly for the first seven, eight, or nine mo this period, a practice which, at first sight, appears to be highly objectio but which is really not so much so as might be supposed; and it is ren absolutely necessary by the fact, that cows could not otherwise be pro kept; nevertheless, it is very important that the milking should not be nued too long, for the sake of the cow, the calf, and the milk itself: in g it should cease at the end of the seventh month; many cowkeepers, ho continue to milk up to a very short period of calving.

Another very objectionable practice is to permit the cow again to bec calf within two or three months after having calved; the object of doin to derive as much profit as practicable from the animal, without regard effect on its constitution, the quality of the milk, or the growth of the ca is impossible to conceive that a cow can continue to yield large quanti good milk daily, and afford, at the same time, sufficient nourishment for ing on effectively the process of gestation.

Influence of Food on Milk.—The natural food of the cow is evidentl derived from pastures, viz. grass, the milk obtained from cows fed upo being of excellent quality and sufficiently rich for all purposes.

The next most natural food is dried grass or hay, which is given lar cows in winter, the milk being nearly the same in quality as from grass.

Beet-root and carrots, being very nutritious, are also usually given t in the winter time with advantage. With regard to the effect of beet-ro carrots on milk, we obtain the following information by MM. O. Henrie an valier, as reported in Mr. Mitchell's treatise on the "Falsification of Fo p. 74.

The constituents of cow's milk in the normal state, according to M Henrie and Chevalier, are as follows:—

Casein (cheesy matter)	4·48
Butter	3·13
Sugar of Milk	4·77
Salts, various	0·60
Water	87·02
	100·00

When the cows are fed on beet:—

Casein	3·75
Butter	2·75
Sugar of Milk	5·95
Salts	0·68
Water	86·87
	100·00

When on carrots:—

Casein	4·20
Butter	3·08
Sugar of Milk	5 30
Salts	0·75
Water	86·67
	100·00

It will be observed that, according to the above tables, the effect of f cows on carrots is to occasion a slight diminution in the amount of case tter, but an increase in the quantity of sugar, while feeding them on be luces still more the quantity of casein and butter, but very largely in sugar, effects which, from the richness of carrot and beet in sugar, ve been anticipated.

As is well known, a very considerable number of the cows which supply Lon- with milk, are kept in various confined and unhealthy places in the metro-; such cows are seldom turned out to grass ; the system of feeding adopted g altogether artificial and unnatural—grains and distillers' wash form the part of their food ; these stimulate the animals unnaturally, and under mulus large quantities of milk of inferior quality are secreted, the cow kly becoming worn out and diseased in consequence.

reference to the effects of grains on cows, Mr. Harley makes the following arks :

"'Brewers' and distillers' grains, and distillers' wash, make the cattle grain-, as it is termed, and prove injurious to the stomach of the animal. It has ascertained that if cows are fed upon these grains, &c., their constitutions me quickly destroyed." *

The *Veterinary Record* for April, 1850, publishes the annexed extract from a York paper, which shows the effect of distillers' wash on cows:—here exists on Long Island, near Brooklyn, several manufactories of milk, process of conducting which should be known ; one of these dairies covers a ce of 600 feet front, by 300 feet deep, carefully fenced in so as to be as pri-e as possible, the business of the people being to drink the milk, not to know it is made, in which enclosure 400 cows are kept the whole year round. se cows are fed on the refuse slop of whisky-distillers, and it is given to them m. Such is the fondness of cows for this vile compound, that after ing fed upon it for a week or more, their appetites become so depraved they will take no other food. The result is, their milk-producing ans are stimulated to a wonderful degree ; they yield enormously, but n become diseased ; their gums ulcerate ; their teeth drop out, and their th becomes fœtid. Though thus diseased, they do not fall away in flesh ; on the contrary, puff up and bloat to an appearance of great fatness ; their nts become stiff, so that they cannot with ease lie down, and rarely, or never, e out alive. Bad as this is, their milk is afterwards mixed with molasses, ter, and whiting, and these sold to the public of New York for pure milk ! It of course very injurious to children, who use it in much greater quantities n adults."

MM. Boussingault and Lebel, from experiments made, have arrived at the con-sion that the kind of food has not a great influence either upon the amount composition of milk, provided quantities containing equal proportions of tritious matter be given.

Influence of Temperature on Milk.—In hot countries and dry seasons the antity of milk yielded is said to be less, but the quality is richer ; it is also ated that cold favours the production of sugar and cheese, whilst hot weather gments the amount of butter.

It would be extremely desirable to ascertain precisely the extent to which the ality of milk is influenced by weather.

Influence of the Time and Frequency of Milking.—With regard to the quality milk as affected by the time and frequency of milking, morning milk is said be better than that obtained in the afternoon ; and the milk of cows when lked but once a day only, is richer than either. It is the common belief that e last portion of the milk obtained at any milking is richer than the first ; we ve taken pains to ascertain whether there is any foundation for such an inion, and find it to be really the case to a remarkable extent, as will appear m the following table :—

ABLE SHOWING THE DIFFERENCE IN THE QUALITY OF THE FIRST AND LAST MILK OBTAINED AT EACH MILKING.

1*st Milk.*

Afternoon.

Cows.	Milk. Spec. Grav.	Cream.
1	1027	9°
2	1026	13

---

* Harleian Dairy System, pp. 73, and 74.

It is really astonishing that cow-keepers do not see that the cause of their ng so many cows by disease is from those close, filthy, unventilated, damp, ly-drained, and ill-constructed sheds. They have it, in some measure, in ir power, one would imagine, to remedy this deadly evil; but it appears they ve very little regard either for the cleanliness of those sheds or their cows, ugh cleanliness should be the life and soul of a dairy in all its departments." The late Mr. Harley, of Glasgow, who kept 300 cows, states that "in close, ventilated cow-houses, the cattle will often be found in a profuse perspiration, ich is brought on solely by their inhaling a vitiated atmosphere, deficient in l air (oxygen gas). This necessarily exhausts their vigour, and makes m liable to be injured by cold; and when they are milked in these dirty eds, the milk is always impregnated with foul air; thus the necessity of per ventilation, and no stagnant water should be allowed to remain on the mises."*

Milk," says Mr. Aiton, "which is one of our most nutritive species of d, is too apt to become neglected, and many have rejected it from a belief t it was seldom obtained free from impurities. The atmosphere of a cow-se not duly ventilated, and especially in the stenching lanes of a large town, nastiness of the cows, want of cleanliness in those who feed and milk them, l the nature of the milk itself, so apt to become impregnated with foul air l every impurity, have often driven people who have a due sense of cleanli-s, as well as those of delicate constitutions, who most needed that excellent torative, from the use of it with disgust."†

Dr. Thompson, in his calculations on the amount of carbon consumed by a w in her food, states, that if his views be correct, upwards of 6 lbs. of carbon expended by a cow, daily, in the production of animal heat; and as one und of carbon, when combined with the necessary amount of oxygen to form bonic acid, gives out as much heat as would melt 104·2 lbs. of ice, it is dent that the quantity of ice capable of being melted by the heat generated one cow in a day, would amount to upwards of 625 lbs., or it would heat one water 87,528°. It would consume, at the same time, the enormous quantity 830,429 cubic inches of oxygen gas, or 191¼ cubic feet; and as this amounts to -fifth of the atmospheric air, we find that one cow, consuming 6 lbs. of carbon respiratory purposes, would require 956¼ cubic feet of atmospheric air."‡

We will conclude our remarks on the housing of cows by the following de- iption of the actual condition of cow-sheds, taken from a pamphlet by the n. F. Byng, on the Sanitary Condition of the Parish of St. James's, estminster:—

"Two of these sheds (of which there are fourteen in the parish) are situated the angle of Hopkins and New Streets, Golden Square, and range one above other, within a yard of the back of the houses in New Street. Forty cows kept in them, two in each seven feet of space. There is no ventilation, save the unceiled tile roof, through which the ammoniacal vapours escape into houses, to the destruction of the health of the inmates. Besides the imals, there is at one end a large tank for grains, a store-place for turnips d hay, and between them a receptacle into which the liquid manure drains d the solid is heaped. At the other end is a capacious vault, with a brick rtition, one division of which contains mangel-wurzel, turnips, and potatoes, d the other a dirty, yellow, sour-smelling liquid, called brewers'-wash, a rtion of which is pumped up, and mixed with the food of the cows. The ighbours are subject also to the annoyance of manure-carts, which frequently nd some time in front of their houses; and when the mouth of the vault opened, to admit the ingress of the brewers' wash, a 'burning sour smell' described by them as pervading their dwellings. After the buildings have mained closed for the night, the atmosphere within becomes heated, foul, d unwholesome. In summer time the smell is most offensive. Decomposi-n of the vegetable matters in the vault is also stated to be frequent, and the ench thence arising insufferable.

"At the opposite side of the houses in the same street is another shed, with en less possibility of ventilation than in those just described. Thirty-two cows stand side by side, two in each space of seven feet, as above. In Marsh Street there is a third establishment, containing twenty-eight cows. In a on one side, overlooking a yard in which is a slaughter-house, are seve grated openings, but they are carefully covered with pieces of sacking, as if prevent all possible admission of air. In this shed are receptacles for vegetab and grains as before: the manure-tank holds twelve tons, and that for brewer wash, 600 gallons.

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* Harleian Dairy System, p. 14. † Aiton's Dairy Husbandry, p. 70.

‡ Thompson's Experimental Researches on the Food of Animals, p. 114.

"It is to be remarked that even the manure, from the nature of the fo supplied to the cows, acquires a peculiarly unhealthy and offensive odo altogether dissimilar to that from farm-fed animals. In this atmosph reeking with all these pestiferous effluvia, the poor creatures are kept close up, night and day, till their milk failing, they are consigned to the butcher.

"The effects of this system of feeding, impure air, and deprivation of all ercise, are thus described from actual inspection of four cows, which the kee said were suffering from the old disease:—There was inflammation of mucous membrane of the mouth, fauces, and gullet, a catarrhal discharge f the nostrils, and such prostration of the muscular system, as to render animals unable to remain in a standing position for any length of time. mucous membrane of the mouth is sometimes so blistered as to prevent animals from taking food.

"Swellings of the udder appeared, attended by a change in the quality, deficiency in the secretion of the milk. The feet also became much dis and swollen; general emaciation followed, in which the animals continue an indefinite period, or till death. Four months prior to this visit, the of one of the sheds lost thirteen cows by disease.

"A Dutch cow was pointed out to me, which was evidently in a st marasmus, her head hanging nearly to the ground, the horns cold, th staring through the hide on each side of her emaciated body, on which th bristled and stood erect. Notwithstanding this prostration of the vital po this cow was regularly milked with the others, furnishing a daily sup two quarts.

"On inquiry, it did not appear that veterinary aid was ever sought; th means used was to keep the poor animals as warm as possible."

Another matter for consideration is the neglected condition of the skin of

"Cowkeepers," remarks Mr. Rugg, "never have the skins of their regularly and properly groomed, which is equally necessary with resp their health, and consequent good quality of their milk, as being well h in properly constructed sheds. The cows would be more healthy, would more milk, and that of a very much better quality.

"It is impossible for cows to be healthy unless the insensible perspirati given off through the pores of the skin, goes on regularly and uninterrup and this cannot be the case when they are kept in dirty cow-houses, a care taken to remove the dirt by which these pores are obstructed. Cows, not having that attention paid to the health of their skins, are frequently to diseases thereof, such as the mange, itch, &c. There is scarcely a co that one enters but some of the beasts will be found afflicted with the I entered one shed under the Adelphi Arches, where forty cows were kep every one of them had that disease; also another shed in the same where the poor beasts never saw the light of heaven from year's end to end, the place being entirely lighted by gas, and the only ventilation that was by means of a small hole, not half a foot square, knocked out of th that forms part of the lane leading to the halfpenny steamboats."

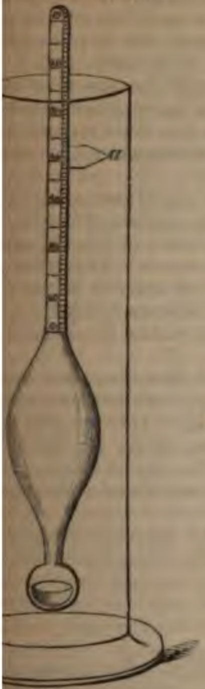
ANALYSIS OF MILK.

With the view of determining approximately the quality of milk, the foll proceedings may be adopted:—

Method of determining the Specific Gravity of Milk.—First. The gravity should be ascertained.

The specific gravity or density of milk is usually determined by mean common hydrometer, in using which the precaution should be taken to the milk up well, as, should the cream have collected on the surface, the gravity would be greatly affected thereby.

Fig. 103.
OMMON HYDROMETER,
(*Reduced one-half.*)



Range of pure milk.

As this report will probably fall into the hands of many persons unacquainted with the nature of the hydrometer, and as it is desirable to simplify as much as possible the means to be pursued in determining the quality of milk, we append a drawing, showing the construction of the ordinary hydrometer.

According to M. Lassaigne and other observers, the ordinary specific gravity of cow's milk at 50° Fahr. is 1031; as will presently appear by our own observations, the specific gravity is liable to the greatest variation, and but seldom reaches the density given by M. Lassaigne. It must be borne in mind, however, that temperature affects somewhat the specific gravity of milk, but unless the extremes be very great this circumstance will scarcely make any material difference in ordinary observation, and it will hardly be necessary to employ a thermometer, and to make corrections for ordinary variations of temperature.

Fat being lighter than water, according as the amount of this varies in any sample of milk, so will that milk vary in specific gravity; if the quantity be very considerable, *cæteris paribus*, the milk will be so much lighter; but if very little, the density will be so much the greater. This is readily shown by taking the specific gravity of milk after the removal of the fat, as of skim milk or serum; if the quantity of fat be very considerable, the difference of specific gravity will amount to several degrees: thus a milk may be of a low density from excess of fat, or it may be of high specific gravity arising *partly* from the deficiency of it. In most cases, however, a high specific gravity obtains in milk possessing the ordinary per-centages of cream. In some samples we have observed both a high gravity and excess of cream; this must have arisen from the presence of quantity of cheese or sugar.

effect of the fat of milk in decreasing its specific gravity is strikingly in the following table, from which it appears that the specific gravity test ly fallacious, and that very frequently the richness of milk is in an inverse that of its density; a conclusion which is just the very opposite to that nly taught and believed.

E SHOWING THE VARIATION IN THE SPECIFIC GRAVITY OF GENUINE
K, AND THE RELATION OF THIS TO THE PER-CENTAGES OF CREAM.

Cows.	Milk. Spec. Grav.	Skim. Spec. Grav.	Cream.
1	1031	—	2°
2	1029	—	2½
3	1019	1027	26
4	1008	1026	80
5	1030	—	2½
6	1027	1030	9
7	1026	1028	13
8	1029	1030	8
9	1030	1031	7
10	1024	1028	10
11	1027	1031	10
12	1023	1030	25
13	1024	1031	32
14	1025	1029	10

The above tables include samples of both morning and afternoon mill well as some of the first and last milk obtained at the same milking; are not, therefore, to be taken as average samples of milk.

From an examination of the table, it appears that a milk may be of high s gravity, and yet yield but little cream (see 1); or it may be of low s gravity, and yet afford a very large quantity of cream (see 4); also, th removal of the cream increases the density of the milk (skim milk) s degrees. It will be observed that not one of the samples in the table sh low specific gravity with deficiency of cream. We have never met w natural milk of this kind, and believe it to be of very rare occurrence.

Method of determining the Cream.— Second. The amount of cream sho ascertained.

The amount of cream is determined by means of an instrument invent the late Sir Joseph Banks, termed a *lactometer*. This consists of a tube, u eleven inches long and half an inch in diameter; ten inches of this are gra in tenths of an inch—that is, in hundredths of the whole. The tube i with milk, and set aside for twelve hours; the cream ascends to the su and its amount is determined by the thickness of the stratum formed, and is ascertained by noting the number of degrees or tenths through wh extends.

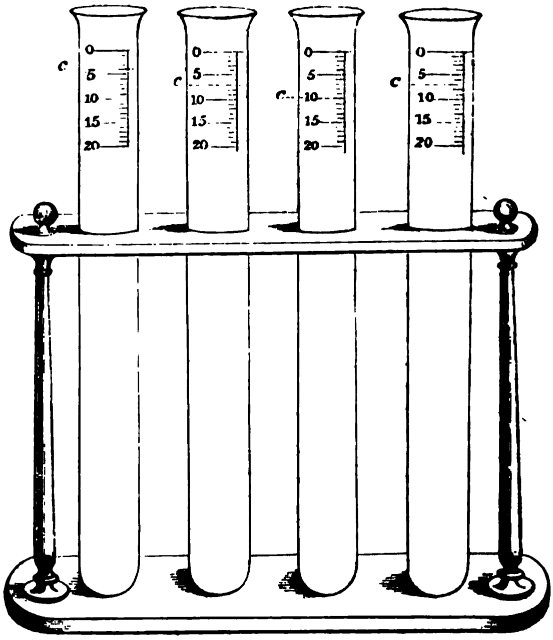
Some lactometers resemble test-tubes in shape, and, like them, are sup in racks; they are usually graduated only in the upper two inches; othe provided with feet, and are graduated throughout their whole length. A quantity of cream not unfrequently exceeds twenty per cent., the tubes s in all cases be graduated for nearly their whole length. As already refer we obtained one sample of milk from the cow, which contained eighty pe of cream.

The construction of the lactometer is shown in the accompanying wo representing a rack, holding four of these instruments.

Fig. 104.

LACTOMETER AND STAND.

(*On a reduced scale.*)



The dotted lines indicate the per-centages of cream on four samples of milk from different cows after standing twelve hours.

eam forms more quickly in warm than cold weather, and in making com-
tive observations on a number of samples, it is proper that each should be
side in lactometers, at the same time and for the same period.

e thickness of the stratum of cream formed on genuine milk is, like the
fic gravity, subject to considerable variation: in two extreme cases we have
with, one of the samples showed but *two* degrees of cream, and the other
y. According to Dr. Normandy, the thickness of the stratum of cream on
milk is generally from eight to eight and a half per-centages. M. Dinocourt
the per-centages to range between 9 and 14, while, according to our
vations, the average does not exceed 9½.

must be remembered that London milk, as delivered to the houses, consists
neral of the milk of different cows mixed together; and therefore, in order
termine what ought to be the depth of cream formed on good milk, we
ld take the average amount obtained from such mixed milks.

e have said that the quantity of cream varies much in different samples of
ine milk; and not only is this the case, but it should also be known that
mount of cream yielded by any sample of milk is no certain criterion by
h to judge of its quality, as some milks are rich in cream and deficient in
n and sugar, and *vice versâ*.

is stated that the addition of a small quantity of warm water to milk
ases the amount of cream: the belief in the accuracy of this statement is
ral, and it is commonly acted upon by milkmen; nevertheless, the assertion
tirely erroneous — the addition of water to milk does not increase the quan-
of cream; it merely facilitates and hastens, in a most remarkable manner,
rmation and separation, as is shown by what follows: —

x lactometers were filled, one with pure milk, the remainder with the same
diluted respectively with ten, twenty, thirty, forty, and fifty per-centages of
r.

venty minutes after the addition of the water, the lactometer showed in the
containing fifty per cent. of water, six degrees of cream; in that with forty
cent., five degrees; with thirty per cent., four degrees; with twenty per
, three degrees; with ten per cent., one degree; and in the pure milk, half
gree only.

the end of forty minutes, the cream stood thus: six and a half degrees on
milk containing fifty per cent. of water; six on that with forty per cent.;
and a half on that with thirty per cent.; five on that with twenty per cent.;
and a half on that with ten per cent.; and four on the pure milk.

the end of twelve hours, the milk with fifty per cent. of water showed five
ees of cream; that with forty per cent., five degrees and three-quarters;
with thirty per cent., six and a half degrees; that with twenty per cent.,
n degrees and a quarter; that with ten per cent., eight degrees; and the
milk, nine degrees of cream.

thus appears, that the addition of a large quantity of water to milk occa-
an almost immediate formation of cream, but does not augment the
unt; of this fact, in some cases, it would be an advantage to dairymen to
themselves. The addition of water to milk of course lessens its specific
ity, and so facilitates the ascension of the cream.

ethod of determining the Fatty Matter. — Cream is nearly identical with the
matter of milk; but as only part of this rises to the surface, part remaining
sed throughout the liquid, in determining the amount of cream, we do not
eed in ascertaining the entire quantity of fatty matter present, and which it
ten necessary to do.

r this purpose acetic acid is to be added to a measured or weighed quantity of
: the acid precipitates the casein, and this, in separating, becomes incorporated
nearly all the butter, the two together forming the curd; this is to be col-
d on a weighed filter, dried by means of blotting-paper, and the fat dissolved
with ether; the etherial solution is next to be evaporated in a weighed cap-
, with a gentle heat, the weight of the residual fat being ascertained by the
ased weight of the capsule. This method for determining the richness of
in butter is of course much more accurate than that by the lactometer.

nother means of ascertaining the amount of butter in milk is by the Lactoscope.

he Lactoscope. — Some years since, an instrument termed a lactoscope was

invented by M. Donné, of Paris, for determining the richness of mil
mating the quantity of butter contained in it.

We have procured one of these instruments, accompanied with a d
and directions for its application; from these we extract the foll
servations: —

" Milk owes its white dense colour to the globules of fatty matter
which it contains; the more numerous these globules the more opa
milk, and the more, at the same time, is it rich in the fatty part or in
more or less opacity being in relation with its principal quality — its
cream; the measure of this opacity is capable of giving then, indi
measure of the richness of the fluid, and of indicating its value.

" But the degree of opacity of milk cannot be appreciated upon a
fluid; it is not possible to measure it but in very thin layers, and it is
is done with our lactoscope. This instrument is constructed in such
the milk may be examined in it in layers of every thickness, from th
through which all objects may be distinguished, up to that which
nothing to be perceived; it gives at once the richness of milk in indi
degree of opacity to which the proportion of cream stands in relation.

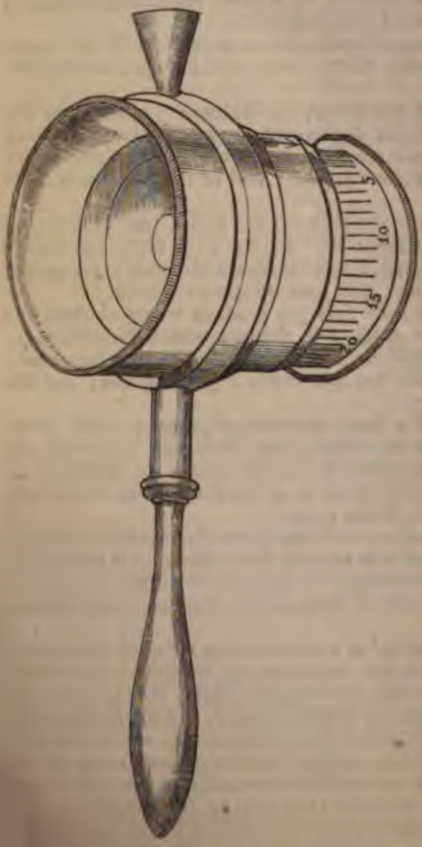


Fig. 105.
The Lactoscope.

" The instrument consists of a kind of eye-glass, composed of
sliding one within the other, furnished with two parallel glasses, whic
each other up to contact, and separate more or less the one from t
will by means of a very fin
little funnel destined to
milk is placed at the uppe
the opposite side is fixed
which serves to hold the i
The tube which screws
other forms the anterior
part, that to which the
plied; it is marked with
the number of 50, and fig
indicate the richness of th

" A few drops of the mil
amined are poured into
It is necessary to take th
milk from the mass of th
not the surface of the l
where the layer of cream
then the milk has been
some time, it must be agit
in order to mix all the par

" The funnel being full,
tube is turned from right
the liquid has penetrated
plates of glass, and colle
bottom; the ocular tube is
in the contrary direction
to right, and one looks
until the flame of a tape
can be distinguished. A
stop and impress a slig
movement, until, by a lit
lation, the light is lost to
out going beyond the m
it is extinguished, so to
ceases to be perceived;
point, definitely, where
sary to stop; it is only th
to read the figure of the
which the arrow corres
we suppose will be 25. T
table shows to what deg
what proportion of cream the figure corresponds.

The light ought to be placed at about a metre (at least three feet) from the rver; a greater distance will not impair the accuracy of the operation, it is not the same if one looks from too near.

One may assure himself of the accuracy of the instrument by adding a very l quantity of water, or even gruel, to the milk. Twenty degrees of water ufficient to change the transparency of the liquid; thus milk marking 25, mark 28 or 30 on mixing with it a little water.

At the moment when the milk is introduced between the two plates of glass, mmonly happens that bubbles of air are enclosed in the layer of liquid; it ecessary to drive them out, and this is easily done by impressing certain ements on the milk, by separating more or less the eye-piece so as to cause wo plates of glass to withdraw and approach each other alternately. When rial is terminated, the eye-piece is to be removed so as to clean the instru- t perfectly, and to wipe the glasses; the glasses ought always to be very ht, and one ought to avoid, during the observation, to tarnish with the th the glass of the eye-piece."

able indicating the Richness of different kinds of Milk, after the Degree which they show on the Lactoscope.

k of cow, giving about 5 per cent. of cream, shows 40 to 35 on the lacto- cope.

o ditto, ordinary, giving from 5 to 10 per cent. ditto, shows 35 to 30 on the ctoscope.

o ditto, sufficiently rich, giving from 10 to 15 per cent. ditto, shows 30 to 25 n the lactoscope.

o ditto, very rich, giving from 15 to 20 per cent. ditto, shows 25 to 20 on the ctoscope.

o ditto, excessively rich (last extraction), shows 20 to 15 on the lactoscope.

o ditto, very weak (first extraction), shows 150 to 3 on the lactoscope.

k of the common ass, of good quality, shows from 50 to 80 on the lactoscope.

to, very weak, shows from 150 to 20 or 4 on the lactoscope.

k of goat, rich, shows 10 to 15 on the lactoscope.

k of woman, rich and substantial, shows 20 to 25 on the lactoscope.

to, medium, shows 30 to 35 on the lactoscope.

to, weak, shows 40 to 45 on the lactoscope.

t must be remembered that the lactoscope has regard only to one element of k, and does not estimate the amount of sugar or cheese. M. Donné enter- s the greatest confidence in the indications which it affords.

The construction of the instrument, and mode of employment, will be more rly understood from an examination of the woodcut on the preceding page.

Method of determining the Cheese.—The curd which is formed in milk on addition of rennet or acetic acid consists, as we have more than once lained, of both the butter and cheese: the former being dissolved out by ans of ether, the residue, which is not acted upon by that menstrum, consists cheese; this is to be dried in a water-bath, and its amount determined by ghing. Thus, the process employed for ascertaining the quantity of butter, to a certain point serves also for determining the quantity of cheese. A rably accurate knowledge of the quality of milk may be obtained by simply ertaining the relative weights of the curd yielded by different milks when efully dried.

ome persons form their judgment of the quality of milk simply by its den- , regarding all samples which do not indicate a certain specific gravity of rior quality. We have already seen that this method is very fallacious, that by it some milks, rich in cream, would be pronounced of inferior lity, in consequence of their low density; while others deficient in that stituent, would be declared of superior quality, on account of their high sity.

thers rely upon the indications afforded by the lactometer, which also has fallacies, but which are not so great when the instrument is used with necessary precautions, as those relating to the specific gravity of milk. e the lactoscope of M. Donné, the lactometer has regard to only one compo- t of milk—namely, the fatty matter.

The following facts will show how fallacious is the lactometer in some
We have met with several samples of genuine milk, which gave only t
four per-centages of cream, but which yet possessed a specific gravity o
judged by the lactometer-test alone, such milks would be pronounced b
very poor, and by others even as adulterated. Now the conclusions would
very great extent erroneous; for such milks, although certainly defic
butter, have the full proportion of the remaining constituents—name
cheese and the sugar. Again, we constantly meet with samples of milk
six, eight, or more per-centages of cream, and which nevertheless, as sh
the specific gravity of the serum, were unquestionably adulterated wit
quantities of water.

The observer who relied upon the indications of the lactometer woul
regarded such samples as of average quality. The inquirer, therefore,
not rely solely upon the specific gravity or lactometer-tests, but in al
employ both, the one acting as a corrective of the fallacies of the other.

For all practical purposes, the above methods of examination are su
Should it be desired to institute a very careful analysis, we may then ad
process described by Haidlen.*

The Butter.—The weighed quantity of milk is mixed with one-sixth
weight of common unburnt gypsum, previously reduced to a very fine
The whole is then evaporated to dryness, with frequent stirring, at the
boiling water; a brittle mass is obtained, which is reduced to a fine powd
digesting this powder in ether, the whole of the butter is dissolved out,
evaporating off the ether, may be obtained in a pure state, and weigh
the powder itself, after being treated with ether, may be dried and we
the butter is then estimated by the loss.

The Sugar.—After the removal of the butter, alcohol is poured up
powder, and digested with it. This takes up the sugar with a little
matter, soluble in alcohol. By evaporating this solution, and weighi
dry residue, the quantity of sugar is determined; or, as before, the
itself may be dried and weighed, and the sugar estimated by the loss.
wish to estimate the small quantity of inorganic saline matter which ha
taken up along with the sugar, it may be done by burning the latter
air, and weighing the residue.

Saline Matter.—A second weighed portion of milk is now carefully
rated to dryness, and again weighed. The loss shows the quantity of the
The dried milk is then burned in the air. The weight of the incombusti
indicates the proportion of inorganic saline matter contained in the milk.

The Casein.—The weight of the butter, sugar, saline matter, and the
being thus known, and added together, the deficiency shows the weight
casein.

If preferred, the following process, by Professor Poggiale †, may be ado

"As none of the processes hitherto known furnish a quick and accura
cation of the richness of milk, I imagined, that if we could determine,
the balance, by the method of volumes, one of its constituent elemen
problem would be solved. I believe I have succeeded in attaining the re
ascertaining the proportion of the sugar of milk. Several samples of pu
have been submitted to chemical analysis.

"The following is the mean of ten analyses:—

Water	862·8
Butter	43·8
Sugar of milk	52·7
Casein	38·0
Salts	2·7
	1000·0

"Thus, according to my experiment, 1000 grammes of milk conta
grammes ‡ of sugar. M. Boussingault found, in a series of observations,

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* Annalen der Chemie und Pharmacie, xiv. p. 263; copied in "Mitchel's Treatise," p. 78.

† "On the Estimation of the Sugar of Milk and Determination of the Richness of Mil
Poggiale. *Chemical Gazette.*

‡ The gramme weighs 15·4330 grains.

of fifty grammes, a difference which is undoubtedly owing to the process followed for its determination. The quantity of sugar contained in milk is considerable, and moreover, presents but slight variations. The process which I propose is the application of that of M. Barreswil to the estimation of the sugar of milk, which, like glucose, reduces the salts of copper, and the proportion of salt of copper decomposed will afford the amount of sugar of milk.

"*Preparation of the Test-liquor.* — This is prepared by adding to a solution of sulphate of copper, bitartrate of potash, and dissolving the precipitate which is formed in caustic potash. The strength of the alkaline solution is then determined with great care, from the quantity of sugar employed to decolorize a known volume of the liquid. It is important to observe that milk-sugar, and not cane-sugar, must be employed in this operation. I made several experiments, in order to avoid the determination of the strength of the solution of binoxide of copper, which is decidedly the longest and most delicate experiment. The following proportions constantly furnished a liquid, twenty cubic centimètres of which correspond to 0·200, or two decigrammes, of whey: —

	Grammes.
Crystallized sulphate of copper - - -	10
Crystallized bitartrate of potash - - -	10
Caustic potash - - - - -	30
Distilled water - - - - -	200

"The filtered liquid is perfectly clear, and of an intense blue colour.

"*Preparation of the Whey.* — To determine the amount of sugar-of-milk, it is indispensable to separate the fatty matter and the casein by coagulation. This is easily effected by placing fifty or sixty grammes of the milk in a small flask, adding to it a few drops of acetic acid, and then raising the temperature to between 104° and 122°. A transparent liquid is obtained on filtration. According to my experiments, 1000 grammes of milk yield 923 grammes of whey, which gives for 1000 grammes of whey about fifty-seven grammes of sugar.

"*Examination of the Whey.*—Twenty cubic centimètres of the test-liquor are introduced by means of a pipette into a small flask, which should be preferred to a porcelain capsule, as it allows of the liquid being seen from top to bottom, and of observing with the greatest ease the moment the decolorization is complete. The liquid is then boiled. On the other hand a burette, each division of which is equal to a fifth of a cubic centimètre, is filled with the whey and poured drop by drop into the liquid, agitating the latter continually, and heating it after each addition of whey. This is continued until the blue tint has entirely disappeared. At first, a yellow precipitate of hydrated protoxide of copper is formed, which, however, soon turns red, and sinks to the bottom of the flask. When the operation is terminated, the quantity of whey employed is read off the burette, and the weight of sugar contained in 1000 grammes of whey determined by the rule of three.

"I admitted above that 1000 grammes of whey contain fifty-seven grammes of sugar; we must, however, not be particular about a few grammes, more or less. The most usual adulteration, the addition of water, is easily detected by estimating the sugar. It is, however, possible that the cream might be removed without any addition of water, or with the addition of cane-sugar, or sugar of milk. In this case, I determined by a simple and quick process the quantity of fatty matter, by adding acetic acid to the milk, boiling and agitating it after cooling with ether, which removes the butter. The ethereal solution is decanted and evaporated. It is frequently advisable to repeat the examination of the whey, which, as all the arrangements are made, and the strength is nearly known, does not occupy more than one or two minutes."

The Centesimal Galactometer.

Some years since an instrument was invented by M. Dinocourt*, under the e name, for determining the goodness and purity of milk. In a pamphlet matory of the use of the galactometer, we meet with the following descrip- of the instrument: —

"The centesimal galactometer is an aerometer of the ordinary form. It differs from it only by its special graduation. Its name, drawn from two Greek words, signifies *measure of milk*. This instrument is used to compare the different kinds of the milk of cows, in relation to their density, and consequetly not make known their degree of purity.

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* Constructeur d'instruments de physique, et de chemie en verre, 9, Quai St. Michel à Paris.

"The centesimal galactometer is represented in the accompanying figure; it is composed—

1st. Of a stem *A a*, enclosing scales.

2nd. Of a cylinder *B*, serving to float it.

3rd. And of a bulb *C*, charged with shot, serving as a ballast, so that the instrument floats upright in the milk. Of these three parts, it is only necessary to well understand one, that which encloses the scales *A a*; the scale *A*, *in part coloured yellow*, serves to weigh the milk with its cream; the first degree on the top of the scale is marked 50. The following extend from 50 to 100 and over.[*] Each degree starting from 100 in mounting up to 50 represents a hundredth of pure milk; the degrees formed by a line are equal, as 50, 52, 54, &c.; the degrees formed by a dot are unequal degrees, as 81, 83, 85, &c. To comprehend well the value of the degrees of this scale, it is sufficient to give an example:— Supposing then that the galactometer is sunk to the 85th degree, that will indicate 85-hundredths of pure milk, and consequently that 15-hundredths of water had been added to this milk; the galactometer is stopped at 60 degrees, there will be 40-hundredths of water, or four-tenths of water added. We see from this that in adding to the number of hundredths indicated by the instrument a complementary number to form one hundred, this complementary number will give in hundredths the quantity of water added to the milk under trial. If we wish to avoid reckoning by hundredths, one may count only by tenths; we have only to notice that the first tenth is white, that the second is coloured yellow, the third is white, the fourth yellow, and that the fifth is also white. This alternation of white and yellow gives a very evident demarcation between each tenth; towards the middle of each tenth we have placed the figures 1, 2, 3, 4, 5, to indicate their order.

"The space comprised between 100 to 120 is also coloured yellow; this comprehends the different densities of pure milk—that is to say, without the extraction of cream, as well as without the addition of water; we have prolonged the scale from 120 to 136, so that it may serve in all cases.

"The scale *a*, in part coloured blue, is destined to weigh skim-milk; it is, like the first, divided into 100 degrees or hundredths, of which the first 50 have been cut off as useless; each degree commencing from 100 to 50, and amounting upwards represents a hundredth of pure skimmed milk; consequently, the manner of estimating the quantity of water added to skim-milk is absolutely the same as for pure milk with its cream; the examples given for estimating the value of pure milk are applicable to skim-milk. We may equally confine ourselves to estimating the value by tenths; these tenths, alternately coloured blue and white, are sufficiently distinct not to be confounded.

"These two scales give the value of milk only in hundredths; nevertheless, it will always be easy to compare these degrees with the density *or specific gravity of milk*; we understand by the word *density* the specific weight of any liquid, water being taken as a thousand, a litre of distilled water weighing 1000 grammes or one kilogramme, at the temperature of 4° of the centigrade thermometer.

"If now we wish to know the density of the milk under trial, we call to mind that 50 degrees of the scale *A* of the galactometer corresponds exactly with 1014 degrees of the densimeter of M. Collardeau[†], and that each tenth of the scale of the galactometer is equal to three degrees of the densimeter; consequently, three-tenths and a third are equal to a degree of this densimeter; thus, 1014 correspond to 50, 1017 correspond to 60, 1020 correspond to 70, &c."

It will be perceived that this instrument is essentially a densimeter or measurer of specific gravity, and since the specific gravity of milk is subject to great variation from natural and other causes, the galactometer is of course, to a great extent, liable to the same fallacies as the densimeter or hydrometer, although both are capable of affording useful indications.

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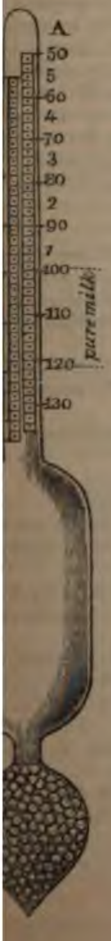
[*] It will be seen that this scale has been cut down to half its graduation, and that its 0 corresponds to distilled water; we have suppressed the first 50 degrees, which would have lengthened the stem of the instrument, and have rendered it more fragile without any utility.

[†] *a* 15° centigrade.

lk not deprived of its cream has a less specific density than skim-milk the lightness of the cream. If the cream be either in part or wholly om milk, the residual milk will weigh heavier than that which conrmal proportion of cream. Skim-milk, therefore, tried by the galacale, for pure milk only, would give a higher specific gravity than belongs to pure milk, and hence the error might be committed of it to be pure, an error which can only be corrected by means of the by estimating with it the per-centage of cream; should this perl short of that which is proper to pure milk, the sample of milk is one f which should be determined by the scale for pure skim-milk.

f to such skim-milk we add a certain per-centage of water, we restore per specific gravity, and therefore this milk would show, with the galactometer, the density proper to pure milk, and hence this fraud pe detection. In order to meet cases of this kind, which are of frerrence — namely, the complete or partial removal of the cream, it is led, and indeed necessary, to employ the lactometer, and ascertain by it whether the sample under examination contains the proper proportion of cream or not; indeed, it is scarcely possible in any case to come to certain or safe conclusions without employing the lactometer.

ig. 106.
AL GALACTOMETER.
educed scale.)



Where the specific gravity of a milk is very light, and this not produced by a large excess of cream, it is due to the admixture of water, the quantity of which may be determined with considerable accuracy by the common hydrometer, but still more accurately by the centesimal galactometer.

The reason for having two scales, one for pure and the other for skim-milk, it will be perceived, is on account of the very different densities possessed by each.

The great advantage of the centesimal galactometer consists in its centesimal graduation, whereby calculation is so much facilitated, and in the wide range of degrees which it affords; thus, while in the hydrometer the range of degrees from pure milk to milk adulterated with fifty per cent. of water is only from 16° to 1031°, that in the centesimal galactometer is from 50° to 130°; by which arrangement far greater accuracy in estimating the density of milk is obtained; thus, three degrees and one-third of the galactometer, as we have seen, correspond with one degree of the densimeter of M. Collardeau.

It is proper, in using the ordinary hydrometer, where the extremes of temperature are great, as in winter and summer, to take the specific gravity of milk, and to make allowance for the difference which temperature occasions; this precaution being necessary with the hydrometer, it is very much more so with the centesimal galactometer, in which, from the delicacy of the graduation, a comparatively slight alteration of temperature occasions a difference of several degrees.

When it is desired to make use of the scale for skim-milk, the temperature and specific gravity should be determined precisely as in the case of pure milk. One portion of the skim-milk is to be set aside for from twelve to twenty-four hours in a lactometer; another in a pan for the same length of time: the per-centage of cream to be noted in the lactometer, and the density of the milk in the pan, after being skimmed, taken in the ordinary manner with the centesimal galactometer, corrections being made for the temperature.

The pamphlet of M. Dinocourt is accompanied with coloured tables of corrections, in which allowance is made for temperature,—that is, the apparent degrees are reduced to real,—the degrees of the hydrometer or densimeter corresponding with those of the centesimal galactometer are shown side by side.

Considered altogether, the centesimal galactometer of M. Dinocourt is capable of affording, especially when used in connection with the lactometer, very useful and accurate indications; much more so than the ordinary hydrometer, the use of which, in taking the specific gravity of milk, ought entirely to supersede it.

We are glad to hear that Mr. Griffin, Manufacturer of Chemical Apparatus, proposes to introduce this instrument into this country, and is about to make it at a cost which will render it accessible to all.

Its construction will be comprehended from the figure appended.

Of all the constituents of milk the sugar is the least subject to variation, and as the density of the serum of milk is principally due to the sugar, its specific gravity of course is also but little liable to alteration. This statement is founded upon the results of numerous observations. It therefore long since occurred to us, that the utility of the galactometer might be greatly enhanced by the addition of a centesimal scale for the serum of milk. The advantage of this scale would be that, starting from a fixed point, the normal specific gravity of the serum, it would show, with very great nicety, the extent of the more usual adulteration of milk, being that with water; for in proportion as water is added, so does the weight of the serum diminish, and this in such a marked manner that the quantity of water added may readily be determined in per-centage. We had intended either to have had an instrument specially constructed to show the varying specific gravity of the serum under different additions of water, or to have modified for this purpose the centesimal galactometer. Pressing engagements have, however, up to this time prevented our giving the necessary attention to the subject. Numerous observations are first required, in order to fix accurately the normal specific gravity of the serum of the milk of the cow.

Adulteration of Milk

Before proceeding to make known the results of our own observations bearing on the adulteration of milk, in accordance with our usual practice, we now give the investigations and remarks of other writers on this subject.

Adulteration with Water.—In reference to this adulteration, Mr. Mitchell makes the following observations:—

"This is the substance that is employed most generally in the adulteration of milk. This fraud is difficult of detection, more especially when the quantity employed is very small.

"The following comparative experiments have been made*:—

The general density of pure milk is about - -	- 1·038
A mixture of 75 parts milk and 25 of water has a density	- 1·021
A mixture of 66 parts milk and 33 of water has a density	- 1·020

"The density of pure milk being variable, it may be readily seen that it is impossible to arrive exactly at the truth, by the density of milk examined, as to the quantity of extra-contained water.

"The truth can only be comparatively arrived at, by ascertaining the *minimum* density of pure milk, and seeing whether the density of the examined sample be above or below that.

"Not only is water added to the milk, but cream, at the same time, abstracted. These two operations cause in the appearance of the milk a very considerable difference, for merely by the abstraction of the cream the residual milk takes a flimsy look, so to speak, together with a bluish tinge. These appearances increase when water has been added, and, in order to mask the two previous impositions, a third, fourth, or even fifth must be practised.

"In order to ascertain whether a partially skimmed milk has been supplied, we must either ascertain the amount of butter, by one of the processes already pointed out, or have recourse to an instrument termed a *lactometer*."

In reference to the same adulteration, Dr. Normandy's work contains the subjoined remarks:—

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* "Dictionaire des Réactifs Chemiques." Par M. J. S. Lassaigne. Article Milk.

'he most frequent, and, one might say, the unexceptionable adulteration of
iilk sold in towns, consists in an addition of water. Pure milk having a
density of about 1·031, or 1·030, the addition of water may, to a certain
t, be detected by means of the specific gravity bottle, or hydrometer.
'ding to M. Lassaigne, the specific gravity of cows' milk, at 50° Fahr., is
; and it would appear that an addition of one-quarter or one-third of the
ie of such milk is necessary to lower its gravity to the extent of 0·017 or
The results of M. Lassaigne's experiments are as follows: —

Pure milk at 50° Fahr. - - -	1·031
73 parts of milk with 25 parts of water - -	1·021
66 ,, 33 ,, - -	1·020

'he specific gravity, therefore, proves only that the density of milk should
be below 1·031 or 1·030; but can give no indication respecting the quantity
up to one quarter.

ulteration with Flour or Starch. — "The simplest indication of the exist-
)f flour or starch in milk is that of small diaphanous clots, which may be
on the sides of the vessel containing it, if it be transparent. Milk con-
g starch burns more readily on the bottom of the vessel in which it is
than pure milk. This, however, is an equivocal test.

'he best test is to add to a portion of the whey of the suspected milk a small
ity of tincture of iodine; if starch be present, a blue colour will become
ent."* — *Mitchell.*

'he milk should first be coagulated, by boiling with it a little acetic acid,
is then filtered. The filtered serum is allowed to cool, and when quite
t is tested with a few drops of a solution of iodine. If this produces a
olour, it is a sign that *starch*, *flour*, or a *decoction of bran*, of *barley*, or
r some other *amylaceous* substance, has been added." — *Normandy.*

lteration with Milk of Almonds. — "This is very little used, on account of
pense; but when it is employed, it may be thus detected. To about a
r of an ounce of the milk, add a few grains of amygdaline, and stir well.
ontains milk of almonds, the odour of *bitter* almonds will be developed in
minutes; if the milk be pure, no peculiar smell will be produced." —
ell.

lteration with Gum. — "This is seldom employed, like the last-named
ince, on account of its expense. The following is the method of discovering
Coagulate the milk by ebullition with a little acetic acid; filter off the
and pour into it a small quantity of alcohol; a dull, opaque, and abundant
precipitate will fall, which, if collected, may be proved to be gum by its
rties.

f the same course of treatment be pursued with pure milk, a very light,
-white precipitate falls, somewhat diaphanous, and in a very small quan-
— *Mitchell.*

'hen *gum-arabic* or *dextrine* has been mixed with milk, its presence may
tected by pouring alcohol in the serum or liquor filtered from the coagu-
roduced by acetic acid, because a white, opaque precipitate is then formed,
different from the light, bluish, and diaphanous flakes which alcohol pro-
in pure milk, which are besides much less abundant. The precipitate
ce may be separated by filtering, and identified as gum or dextrine by
r.

'he addition of gum-arabic to milk seems hardly probable, at least practi-
since it scarcely affects the density of the milk. According to M. Que-
, an addition of not less than 1582 grains per quart of water is required to
it to a density of 1·030, which is about the density of milk. The fraud
therefore be unprofitable, and consequently is not very likely to take
" — *Normandy.*

lteration with Gum Tragacanth "is sometimes employed in the state of
ge to augment the volume of the cream in ordinary milk, or to stimulate
sence on skim-milk. Gum tragacanth may be detected by boiling the
and leaving it at rest for some hours; a gelatinous, translucid deposit is
rmed, which being washed with a small quantity of water, and tested by

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* Des Falsifications des Substances Alimentaires, par Garnier et Harell, p. 278.

a few drops of solution of iodine, produces a blue colour, because gum tragacanth contains starch.

Adulteration with Chalk. — "The common notion of milk being adulterated with chalk, or *whiting*, is unfounded. Such an adulteration is not practicable without being immediately detected; because the smallest quantity of *whiting*, or chalk, speedily separates, and falls to the bottom. I have been frequently called upon to examine samples of milk supposed to be sophisticated with whiting, but a chemical examination of the milk always proved the contrary. That a liberal quantity of water is often added to the London milk admits of no doubt." — *Accum.*

The presence of this body may be determined by evaporating and igniting a portion of the milk, treating the residue with a small quantity of hydrochloric acid, and filtering. If, on the addition of a few drops of a solution of oxalate-of-ammonia, a tolerably abundant precipitate is formed, chalk is present in the milk. A very slight precipitate always takes place under these circumstances with milk.

Adulteration with Turmeric. — "*Turmeric* may be detected by evaporating a portion of the milk to about one-eighth its bulk, and then adding caustic potash in small quantity. If the yellow colour of the milk be rendered brownish, turmeric has been added. A solution of this substance is added for the purpose of producing in milk a richness of colour, serving to prevent dilution with water and abstraction of cream being apparent." — *Mitchell.*

On the addition of Carbonate of Soda to Milk. — "In order to prevent milk from turning sour, or from coagulating, a little carbonate of soda may be, and is sometimes, added; milk may thus be kept for eight or ten days. This addition is harmless, provided the quantity added be not too great. According to D'Arcet, $\frac{1}{2000}$ part of bicarbonate of soda is sufficient for the purpose. The carbonate of soda in milk may always be detected by adding to the milk its own weight of strong alcohol, by which the caseum is separated; both the caseum on the filter, and the liquor filtered therefrom, being tested with red litmus paper or turmeric paper, an alkaline reaction will be observed, if carbonate of soda is present, that is to say, the reddened litmus paper will be rendered blue, and the turmeric paper brown. Moreover, if the filtrate be evaporated to dryness, and an acid poured on the residuum, a perceptible effervescence will be observed, which is due to a disengagement of carbonic acid gas, from the decomposition of the carbonate of soda by the acid employed. Pure milk treated in the same manner yields a caseum and serum, which is neutral to test-papers, or which has a slightly acid reaction, and the dry residue of the evaporated serum never effervesces when treated by an acid." — *Normandy.*

Adulteration with Sugar. — "According to MM. Raspail and Baruel, two per cent. of sugar added to milk are sufficient to impart a decided sugary flavour to it, and even one per cent. is sufficient to impart an unusual degree of sweetness. Sugar, therefore, can hardly be employed to augment the density of milk. However this may be, its presence is easily detected by coagulating the milk, filtering, and mixing a little yeast with the filtrate. If the whole be then exposed to a temperature of between 70° and 80° Fahr., an abundant and rapid disengagement of gas will take place in the course of two or three hours. Fermentation in that case is a sure sign of the presence of sugar, for pure milk cannot ferment, at least in so short a time, and the fermentation is never brisk. But the smallest proportion of sugar (either grape or cane-sugar) very speedily gives rise to a tumultuous fermentation." — *Normandy.*

Adulteration with Emulsion of Hemp-seed. — "The experiments of M. Quevenne seem to prove that the emulsion of hemp-seed, and of almonds, cannot be employed for adulterating milk, as is generally supposed, for hemp-seed communicates to the milk a very unpleasant flavour, and almonds very speedily coagulate it." — *Normandy.*

Adulteration with Cerebral Matter. — "As to the adulteration of milk by the addition of the cerebral matter of various animals, accounts of which were published by newspapers some time ago, it would appear from the experiments which were performed at that time by the 'Conseil de Salubrité,' that no s
admixture could be detected in any of the considerable number of sample
milk which were then submitted to examination; the results of the inve

made by the eminent chemists of the Conseil have proved that were this ingly horrible fraud ever practised, it would be immediately detected by :roscope." — *Normandy.*

'he Effect of storing Milk in Zinc Pans. — "Milk is sometimes kept in ıns for the purpose of augmenting the yield of cream. It should be that lactic acid, which is formed in that case, and which exists in the free ren in new milk, might decompose a little of the carbonate, or saturate a ' the oxide of that metal, and render the milk unwholesome and possibly ›us. The presence of zinc is detected by coagulating the milk with nitric tering, super-saturating with ammonia, and filtering again if necessary; ouring hydro-sulphuret of ammonia in the clear filtrate, a white precipi- formed, it is sulphuret of zinc." — *Normandy.*

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re giving the results of the examination of milk purchased in the metro- t is desirable to determine certain particulars in reference to the specific of samples of milk as obtained from different cows, and the per-centage m, to serve as standards of comparison.

showing the Specific Gravity of Pure Milk, and the Per-centages of Cream.

Morning Milk.

Cows. Richmond.	Milk. Spec. Gravity.	Cream.	Curd.
1	1030	6½	63 grs.
2	1031	7	69 ,,
3	1028	4½	66 ,,
4	1030	9	80 ,,
5	1031	10	78 ,,
6	1028	7½	75 ,,
London.			
7	1030	12	55 ,,
8	1023	5	81 ,,
9	1029	7	61 ,,
10	1028	9	65 ,,
	Average nearly 1029	Total - 77½ Average about 7½.	Total - 693 ,,

Afternoon Milk.

Cows. Richmond.	Milk. Spec. Gravity.	Cream.	Curd.
1	1028	7½	69 grs.
2	1027	10	91 ,,
3	1027	6	75 ,,
4	1028	9	78 ,,
5	1028	11½	87 ,,
6	1027	7½	83 ,,
London.			
*7	1028	22	98 ,,
*8	1026	6	74 ,,
*9	1026	6	69 ,,
*10	1026	11	86 ,,
	Average about 1027	Total - 96½ Average more than 9½.	Total - 810 ,,

Richmond cows from which the first six morning and afternoon milks ›btained, were fed partly on grass and partly on grains. It is desirable e following particulars relating to each cow should be made known: —

Cows.	Age.	Number of Calves.	Date of last Calf.	Yield per D
1	5½ years	3	5 weeks	14 quarts
2	7 "	4	7 months	7 "
3	7 "	4	5 "	10 "
4	8 "	5	6 "	16 "
5	5 "	3	7 "	8 "
6	10 "	7	5 "	12 "
*7	6 "	2	10 weeks	10 "
*8	6 "	3	3 "	10 "
*9	5 "	2	3 months	10 "
*10	7 "	3	9 weeks	9 "

The samples were taken from the milk-pail containing the whole of the mil obtained from each cow, and whilst still warm.

From the preceding tables, it appears —

1st. That the specific gravity of genuine milk, in its ordinary condition, varie between 1031 and 1026; and that the average specific gravity of the mornin milk is about 1029, and the afternoon 1027.

2nd. That the amount of cream ranges from 4½° to 22°, the average being 9

3rd. That the quantity of curd varies from 55 to 98, the average being 75.

The above are the results in the case of samples of milk of ordinary quality; but exceptional cases sometimes occur, in which the specific gravity is less, a also the quantity of cream, curd, butter, and cheese.

TABLE SHOWING THE DENSITY OF SERUM, AND ITS RELATION TO THE SPECI GRAVITY OF MILK.

Cows.	Milk. Specific Gravity.	Serum. Specific Gravity.	Cows.	Milk. Specific Gravity.	Serum. Specific Grav
1	1029	1028	22	1022	1027
2	1026	1028	23	1030	1027
3	1029	1025	24	1031	1028
4	1031	1027	25	1028	1028
5	1030	1027	26	1030	1028
6	1008	1025	27	1031	1028
7	1019	1027	28	1028	1027
8	1026	1026	29	1028	1027
9	1030	1027	30	1027	1028
10	1028	1028	31	1028	1027
11	1027	1027	32	1030	1028
12	1026	1027	33	1029	1028
13	1027	1025	34	1026	1027
14	1029	1027	35	1024	1025
15	1030	1027	36	1027	1026
16	1030	1027	37	1026	1028
17	1023	1028	38	1028	1028
18	1023	1028	39	1026	1027
19	1025	1027	40	1026	1026
20	1024	1027	41	1030	1026
21	1024	1028	42	1023	1028

The above table includes many samples of milk of an exceptional character.

It will be observed, that while the specific gravity of the milk extends over wide range, varying from 1008 to 1031, that of the serum, on the contrary, subject only to a slight variation, the limits being from 1028 to 1025.

We have here, then, a fixed datum, from which to determine, with precisio the adulteration of milk with water, a point of the greatest importance.

TABLE SHOWING THE EFFECT OF THE ADDITION OF DIFFERENT PER-CENTAG OF WATER ON THE SERUM OF MILK.

Milk containing Per-centages of Water.	Specific Gravity.	Skim-milk. Specific Gravity.	Serum. Specific Gravity.	Curd Grai
50	1014	15	16	29
40	1017	18	17	35
30	1020	21	21	42
20	1023	25	22	50
10	1026	27	25	54
Pure	1029	30	29	61

rom the above table it appears that the serum of milk, the density of which
self subject to slight variation only, experiences a marked and uniform
ation of specific gravity, on the addition of different per-centages of water.
ting, therefore, from these points, we have the means of ascertaining, not
the adulteration of milk with water, but even of calculating, with very
iderable accuracy, the proportion of water that has been added to any
le of milk. Although this calculation may be effected with the common
ometer, more accurate results are to be obtained by means of an instrument
tructed on the centesimal principle; such we intend to have made for this
ose. The objections to the ordinary hydrometer are, that it is not easy to
with it specific gravities within a degree or so, and that it is rare to meet
two instruments of this kind that correspond exactly with each other, there
a difference sometimes of as much as two degrees.

e specific gravity of skim-milk, although less uniform than that of the
n, is yet much more so than pure milk; on this account, the next most
ate method of determining the admixture of water with milk is, to take
ensity of skim-milk, the per-centage of cream being previously ascertained
e lactometer.

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lts of the Microscopical and Chemical Examination of Twenty-
Samples of Milk purchased at the Establishments of different
wkeepers and Dairymen resident in the Metropolis.

ample.—Purchased of J. Hendron, 80. Earl-street, Paddington.
alysis.—Specific gravity of *milk*, 1028; of *serum*, 1025; per-centage of
ream, 5°; weight of dried *curd*, 50 grains.

will be observed that the specific gravity of the serum is just upon the
t limit of the density of pure serum, while the quantity of cream and of
is much below that which is proper to good milk; this milk, therefore, is
one of inferior quality, or it has had a small per-centage of water added
and a portion of cream subtracted.

Sample.—Purchased of T. Mansell, 10. New Church-street, Edgware-road.
ulterated—specific gravity of *milk*, 1023; of *serum*, 1020; per-centage of
ream, 2°; weight of dried *curd*, 42 grains.

is milk has been adulterated with from 25 to 30 per cent. of water, and has
been deprived of the greater part of its cream.

Sample.—Purchased of H. Leach, 34. Lisson-grove.
ulterated—specific gravity of *milk*, 1022; of *serum*, 1022; per-centage of
ream, 8°; weight of dried *curd*, 45 grains.

is milk has had added to it about 20 per cent., or one-fifth, of water.

Sample.—Purchased of Mr. Sales, 13. Upper Lisson-street, Paddington.
ulterated—specific gravity of *milk*, 1020; of *serum*, 1018; per-centage of
ream, 6°; weight of *curd*, 43 grains.

is milk has been adulterated with about 25 per cent. of water.

Sample.—Purchased of F. Holder, 31. Homer-street, New-road.
nuine—specific gravity of *milk*, 1030; of *serum*, 1027; per-centage of
ream, 29°; weight of dried *curd*, 64 grains.

hile set aside in the lactometer, this milk became slightly acid and curdled;
tion of the curd rising with the cream increased its apparent amount, which,
t not been for this circumstance would not have shown so high a per-centage
. This is an instructive fact, as it shows that the milk to be tested by the
meter ought to be perfectly fresh, and ought not to be permitted to remain
at instrument (in warm weather) more than twelve hours. We have met
several samples in which the amount of cream has been apparently increased
this cause, and others in which it would not rise to the surface at all.

Sample.—Purchased of C. Cutts, 28. Praed-street, Paddington.
alysis.—Specific gravity of *milk*, 1021; of *serum*, 1024; per-centage of
ream, 22°; weight of dried *curd*, chiefly *butter*, 72 grains.

will be noticed that this milk yields a very large per-centage of cream, and
the serum is under the usual standard. On an examination of the cream
the microscope, numerous corpuscles, peculiar to and characteristic of
trum—that is, of the milk of the cow of the first month after calving, were

discovered; it is perhaps more safe to regard this milk as exceptional, and not to pronounce upon its admixture with water from the specific gravity of the serum.

7th Sample.—Purchased of J. Harris, 17. Harrow-road.

Analysis.—Specific gravity of *milk*, 1023; of *serum*, 1023½; per-centage of *cream*, 12°; weight of dried *curd*, 72 grains.

There were noticed in this case a few colostrum corpuscles; this milk appears to resemble somewhat the previous sample (No. 6.).

8th Sample.—Purchased of P. Mullins, 30. Bryanston-street.

Genuine.—Specific gravity of *milk*, 1027; of *serum*, 1025; per-centage of *cream*, 12°; weight of dried *curd*, 66 grains.

9th Sample.—Purchased of J. Ennever, 31. Upper York-street, Bryanstone-square.

Genuine—Specific gravity of *milk*, 1028; of *serum*, 1027; per-centage of *cream*, 13°; weight of dried *curd*, 64 grains.

10th Sample.—Purchased of B. Mills, 33. Adam-street, Portman-square.

Adulterated—Specific gravity of *milk*, 1024; of *serum*, 1022; per-centage of *cream*, 6°; weight of dried *curd*, 45 grains.

This milk is admixed with about 20 per cent. of water.

11th Sample.—Purchased of T. Turner, 41. Adam-street West, Portman-square.

Adulterated—Specific gravity of *milk*, 1026; of *serum*, 1023; per-centage of *cream*, 8°; weight of dried *curd*, 53 grains.

This sample contains about 15 per cent. of water.

12th Sample.—Purchased of R. Robbins, 79. Adam-street West, Portman-square.

Genuine—Specific gravity of *milk*, 1030; of *serum*, 1027; per-centage of *cream*, 15°; weight of dried *curd*, 73 grains.

13th Sample.—Purchased of E. Edmonds, 23. Edgware-road.

Adulterated—Specific gravity of *milk*, 1023; of *serum*, 1022; per-centage of *cream*, 12°; weight of dried *curd*, 56 grains.

This milk contains about 20 per cent. of water.

14th Sample.—Purchased of C. Crew, 60. Bell-street, Paddington.

Adulterated—Specific gravity of *milk*, 1018; of *serum*, 1017; per-centage of *cream*, 8°; weight of dried *curd*, 48 grains.

This sample of milk is adulterated with 35 per cent., or upwards of one-third of water.

15th Sample.—Purchased of H. Edwards, 39. Exeter-street, Paddington.

Adulterated—Specific gravity of *milk*, 1016; of *serum*, 1016; per-centage of *cream*, 4°; weight of dried *curd*, 42 grains.

This milk is adulterated with about 45 per cent. of water.

16th Sample.—Purchased of Mr. Rowley, 78. Salisbury-street, Paddington.

Adulterated—Specific gravity of *milk*, 1015; of *serum*, 1016; per-centage of *cream*, 5°; weight of dried *curd*, 42 grains.

This milk is adulterated with about 44 per cent., that is, it consists of nearly one-half water; the centesimal galactometer stood in it at 56°, which gives the same per-centage of water; thus, by observations made with two different kinds of instruments results nearly similar were obtained.

17th Sample.—Purchased of J. Cheney, Dorset House, 93. Mount-street, Grosvenor-square.

Genuine—Specific gravity of *milk*, 1029; of *serum*, 1028; per-centage of *cream*, 10½°; weight of dried *curd*, 68 grains.

The centesimal galactometer stood at 109°; that is, nearly in the middle of the scale for pure milk.

18th Sample.—Purchased of W. Ball, 23. Davies'-street, Berkeley-square.

Genuine.—Specific gravity of *milk*, 1028; of *serum*, 1027; per-centage of *cream*, 8½°; weight of dried *curd*, 63 grains.

The galactometer stood in the milk at 104°.

19th Sample.—Purchased at the Friern Manor Farm Dairy, 8. Charles-street, Berkeley-square.

Genuine—Specific gravity of *milk*, 1029; of *serum*, 1028; per-centage of *cream*, 9½°; weight of dried *curd*, 66 grains.

20th Sample.—Purchased of T. Tubb, Original Alderney Dairy, 59. Brooke-street, Hanover-square.

Genuine—Specific gravity of *milk*, 1028; of *serum*, 1027; per-centage of *cream*, 8°; weight of dried *curd*, 71 grains.

e.—Purchased of W. Eaton, 17. Paradise-street, Marylebone.
ted—Specific gravity of *milk*, 1022; of *serum*, 1022; per-centage of
10°; weight of dried *curd*, 69 grains.
contains about 20 per cent. of water.
le.—Purchased of W. Wrench, 7. William-street, Marylebone.
—Specific gravity of *milk*, 1027; of *serum*, 1027; per-centage of
15°; weight of dried *curd*, 79 grains.
le.—Purchased of R. Ragg, 9. William-street, Marylebone.
ted—Specific gravity of *milk*, 1023; of *serum*, 1022; per-centage of
7°; weight of dried *curd*, 60 grains.
is adulterated with about 20 per cent. of water.
e.—Purchased of E. Reynolds, Farnborough Farm Dairy, 44. Pad-
n-street.
—Specific gravity of *milk*, 1027; of *serum*, 1027; per-centage of
$5\frac{1}{2}$°; weight of dried *curd*, 56 grains.
tity of cream on this milk is below the usual average.
.—Purchased of Mr. Ranson, 44. North-street, Manchester-square.
—Specific gravity of *milk*, 1027; of *serum*, 1026; per-centage of
7°; weight of dried *curd*, 67 grains.
e.—Purchased of Mr. Harris, 9. James-place, Charles-street West,
gton.
—Specific gravity of *milk*, 1026; of *serum*, 1026; per-centage of
$8\frac{1}{2}$°; weight of dried *curd*, 69 grains.

examination of the above Table it appears that out of twenty-six
milk submitted to analysis—

twelve were genuine.

of these, *two* showed a deficiency of cream.

eleven were adulterated.

this adulteration consisted, in all cases, of *water*, the per-centages
h varied from ten to fifty per cent., or one half of the article.

in no case was chalk, size, gum, sheep's brains, or any of the other
nces said to be occasionally used for the adulteration of milk, detected.

ults are more favourable than might have been anticipated from the
made by writers, and the belief generally entertained respecting the
of milk.

ion of water to milk is, however, a fraud of the gravest description,
ies practising it, are morally as guilty as though they had employed,
ose of adulteration, the brains of sheep, or any other equally dis-
stance.

in the examinations we have made of milk, we have not met with
dulteration than that with water, we are yet not warranted in con-
no other adulterations are practised; the revelations that have come
n time to time have shown that other frauds in milk are sometimes
It is extremely satisfactory, however, to be able to inform the
the milk, as supplied to them, although bad enough, is not in so bad
as generally reported and believed.

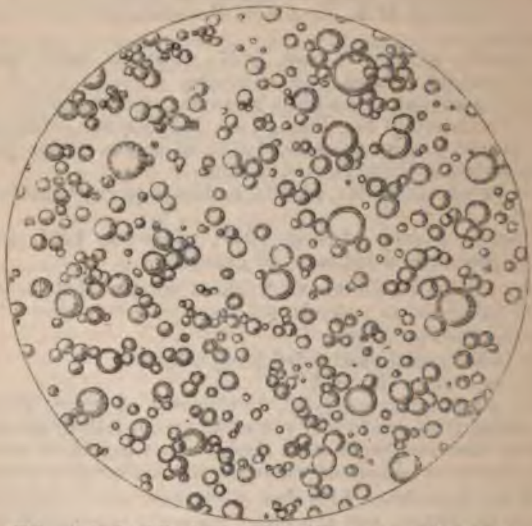
countries and cities the necessity of securing a supply of genuine
ned of such importance that enactments imposing fines and penalties
ting it have been enforced. Although, from the *laissez-aller* prin-
manifested, in relation to the important subject of the adulteration
have no reason to expect that any public regulation will be put in
ck the adulteration of this prime article of consumption, we yet con-
e have rendered the public a good service, in not only making known
f parties guilty of scandalously adulterating milk with water, but
n pointing out simple means by which, with a little trouble, each
ascertain for himself whether the milk supplied to him be genuine
ese means are—

scertain, through the instrumentality of a graduated glass tube,
tometer, the amount of cream, which ought not to be less than eight
s. This instrument can be purchased of almost any glass manu-
philosophical instrument maker; it may be procured of Mr. Griffin,
uare, or at the Whitefriars Glasshouse, Bouverie-street, Fleet street.

2nd. To take the specific gravity of the milk with the common hydrometer, or, better still, by the centesimal galactometer, or the instrument for taking the density of the serum of milk, referred to in a previous part of this report.

In this investigation, as in all others relating to the adulteration of food, the microscope is capable of affording invaluable assistance. The fatty matter of milk, as already described, and upon which its value mainly depends, exists in the form of innumerable semi-opaque white globules of various size. In good milk these globules are seen by the microscope to be very abundant, and some of them are of considerable size.

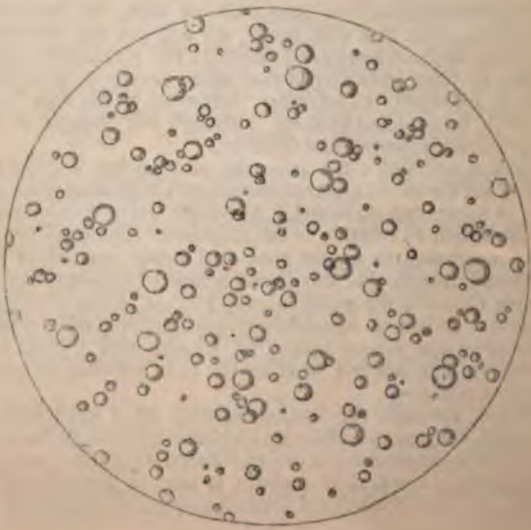
Fig. 107.
GOOD MILK.



This and the five following figures are all drawn to a scale of about 630 diameters.

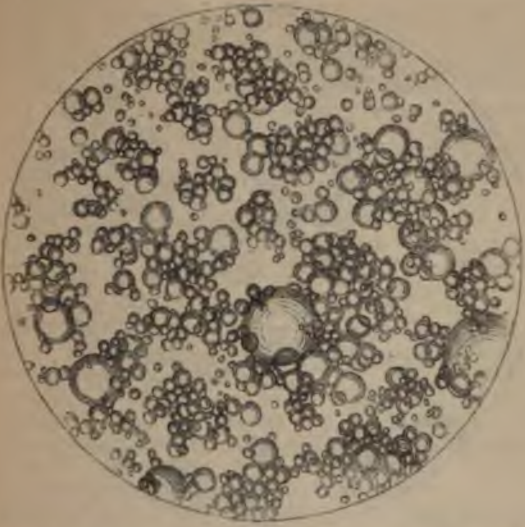
In poor milk the globules are much less numerous, and of smaller size.

Fig. 108.
POOR MILK.



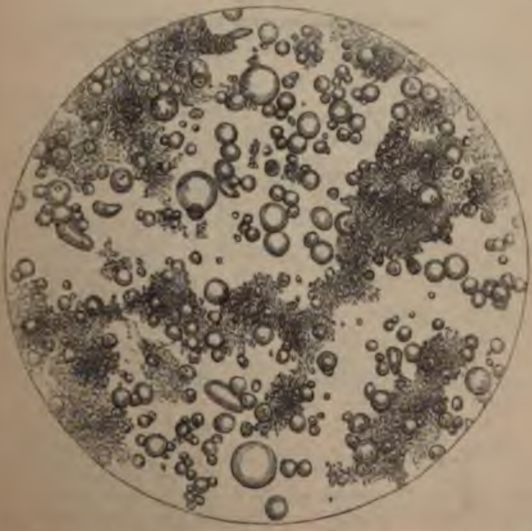
m consists almost entirely of these fat globules, some of which are often
th of very considerable size.

Fig. 109.
CREAM.



curd of milk, as already explained, is composed of both the cheese and
globules. Its appearance under the microscope is represented in fig. 110.;
ein or cheese is distinguished by its granular texture.

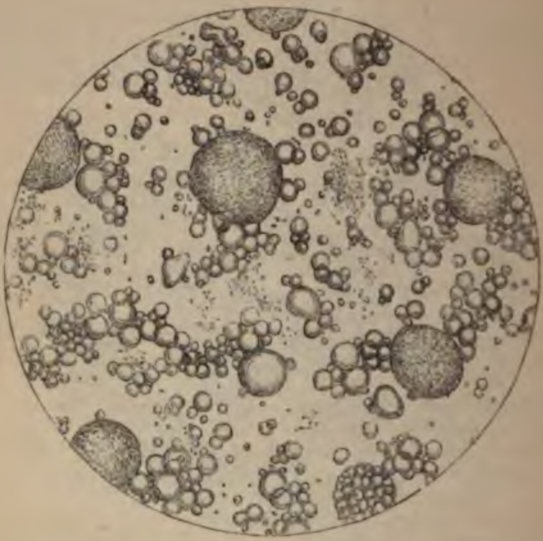
Fig. 110.
CURD OF MILK.



first milk yielded by the cow after calving, called colostrum, is charac-
, as before noticed, by the presence of numerous corpuscles of large size

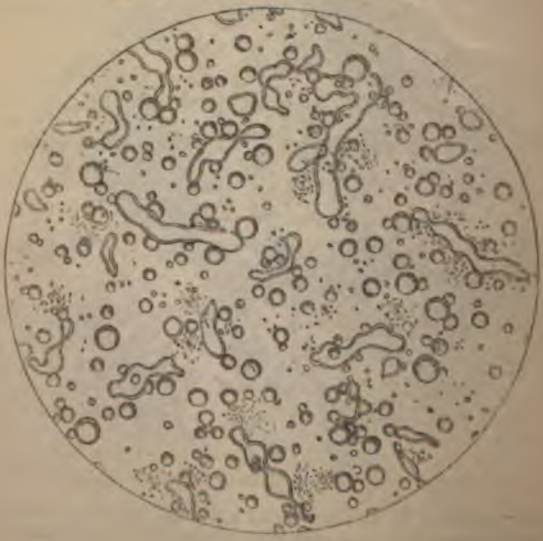
and granular appearance. Cow's milk in the state of colostrum is represented in fig. 111.

Fig. 111.
COLOSTRUM.



The disgusting adulteration of milk with cerebral matter, known to be occasionally, although it is to be hoped very rarely practised, is readily detected in recent milk by the aid of the microscope, portions of the nerve-tubules being discovered in such milk.

Fig. 112.
MILK ADULTERATED WITH SHEEP'S BRAINS.



RROW-ROOT, AND ITS ADULTERATIONS.

Report* on Arrow-root we minutely described the different kinds
oot met with in commerce, gave engravings showing the structural
s of the starch-granules, stated the relative values of each kind, and
he results of the microscopic examination of fifty different samples.
Report, however, there was one thing which we did not do. We then
except in the case of proprietary arrow-roots, from making known
of those persons from whom adulterated arrow-roots had been pro-
, however, many months have elapsed since we first commenced our
ons, and as all parties have now had ample notice and warning, we
e present occasion discharge our duty to the public, by giving to the
name of each individual from whom arrow-root was purchased, and
er the article, on examination, was ascertained to be genuine or adul-

F THE MICROSCOPICAL EXAMINATION OF THIRTY-SIX SAMPLES OF
ROOT OF DIFFERENT QUALITIES AND PRICES, PURCHASED AT DIF-
SHOPS IN THE METROPOLIS.

e. — Purchased of C. Carter, 292. Oxford-street. Price 2*s.* per lb.
ted — admixed to a large extent with *sago-powder.*
e. — Purchased of Westbrook and Company, 21. Oxford-street. Price
. per lb.
ted — containing *very much sago powder.*
rst Report on Arrow-root, we stated that we had detected sago-powder
er of arrow-root purchased of Westbrook and Company; we discovered
rticle in two other samples of loose arrow-root purchased at the same
ent on the same occasion.
e. — Purchased of J. Lawrence, 51. Broad-street, Bloomsbury. Price
. per lb.
Marania or West India arrow-root.
. — Purchased of E. Folkard and Company, Drury-lane. Price 1*s.* 4*d.*
.
ted — consisting chiefly of *sago-powder.*
e. — Purchased of E. Folkard and Company, Drury-lane. Price 2*s.*
.
Maranta arrow-root.
e. — Purchased of Belchem, 120. Drury-lane. Price 1*s.* 4*d.* per lb.
ted — *the greater portion consisting of potato-flour*, with very little
ta arrow-root.
. — Purchased of Hale and Co., 100. Drury-lane. Price 1*s.* 4*d.* per
.
Maranta arrow-root.
e. — Purchased of W. E. Rogers and Company, Clare-street, Clare-
t. Price 1*s.* 4*d.* per lb.
Maranta arrow-root.
e. — Purchased of G. Clarkson, corner of Marshall-street, Golden-
. Price 1*s.* 4*d.* per lb.
ng almost entirely of potato-flour.
le. — Purchased of J. Hale, 53. Brewer-street, Golden-square. Price
r lb.
Maranta arrow-root.
le. — Purchased of H. J. Knevett, 7. Windmill-street, Haymarket.
1*s.* 4*d.* per lb.
ted — containing *very much sago-powder*, and *a little tapioca-starch.*
le. — Purchased of S. Saward, 21. Little Windmill-street, Golden-
. Price 1*s.* 4*d.* per lb.

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* THE LANCET of February 1. 1851, p. 139., and p. 31. of the present work.

Adulterated—consisting of a mixture of *sago-powder*, *Maranta arrow* and *tapioca-starch*.

13*th Sample.*—Purchased of Russell and Company, 21. King-street, C garden. Price 1*s.* per lb.

Adulterated—consisting of a mixture of *sago-powder*, *Canna arrow-r Tous les Mois*, *Maranta arrow-root*, and *a little potato-flour*.

14*th Sample.*—Purchased of Underwood Brothers, 8. King-street, C garden. Price 1*s.* 4*d.* per lb.

Genuine Maranta arrow-root.

15*th Sample.*—Purchased of N. Yarrow, 42. King-street, Snow-hill. 1*s.* 4*d.* per lb.

Genuine Maranta arrow-root.

16*th Sample.*—Purchased of J. Roberts and Company, Barbican. Price per lb.

Consisting almost entirely of potato flour.

17*th Sample.*—Purchased of Liquorish and Company, 50. Beech-street, can. Price 2*s.* per lb.

Adulterated—containing *much potato flour*, a *little Curcuma or East arrow-root*, with a small proportion of Maranta arrow-root.

18*th Sample.*—Purchased of J. Thomas, 107. Upper Whitecross-street. 1*s.* 4*d.* per lb.

Genuine Maranta arrow-root

19*th Sample.*—Purchased of A. Dutton, 84. Whitecross-street. Price per lb.

Genuine Maranta arrow-root.

20*th Sample.*—Purchased of E. Taylor, 89. Whitecross-street. Price per lb.

Adulterated—consisting *principally of potato-starch.*

21*st Sample.*—Purchased of W. Earl, 128. Whitecross-steeet. Price 1 per lb.

Genuine Maranta arrow-root.

22*nd Sample.*—Purchased of Betherege and Company, 152. Upper White street. Price 1*s.* 4*d.* per lb.

Genuine Maranta arrow-root.

23*rd Sample.*—Purchased of Stevenson and Company, 159. Whitecross- Price 1*s.* 4*d.* per lb.

Genuine Maranta arrow-root.

24*th Sample.*—Purchased of G. W. Turner, 215. Whitecross-street. 1*s.* 4*d.* per lb.

Adulterated—consisting *principally of sago-meal.*

25*th Sample.*—Purchased of Robert Jackson, 21. Goswell-street. Price per lb.

Genuine Maranta arrow-root.

26*th Sample.*—Purchased of T. Barber, 104. Goswell-street. Price 1 per lb.

Genuine Maranta arrow-root.

27*th Sample.*—Purchased of Anderson and Company, 26. Old-street- Price 1*s.* 6*d.* per lb.

Genuine Maranta arrow-root.

28*th Sample.*—Purchased of S. Rains, 115. Old-street-road.

Consisting almost entirely of potato-starch.

29*th Sample.*—Purchased of Phillips & Co., 37 & 38. Aldersgate-street. 1*s.* 4*d.*

Genuine Maranta arrow-root.

30*th Sample.*—Purchased of T. Smith, 53. Aldersgate-street. Price 1 per lb.

Adulterated—consisting of *a mixture of Tous les Mois, and Maranta a root*, with *a little potato starch.*

31*st Sample.*—Purchased of W. Rhodes, 77. Aldersgate-street. Price per lb.

Adulterated—*with sago-powder.*

ple.— Purchased of Lloyd, Hare & Co, 141. Aldersgate-street.
s. 4*d.* per lb.
Maranta arrow-root.

ARROW-ROOT SENT TO WORKHOUSES.

le.— Sample of arrow-root supplied to the St. Marylebone Workhouse.
ted — Consisting chiefly of *tapioca-starch*, with *some sago-powder*,
little Maranta arrow-root.

le. — Sample of arrow-root supplied to the in-door poor of the Ken-
Workhouse.
Maranta arrow-root.

le. — Sample of arrow-root, given to *out-door poor* of the Kensington
, supplied by contract.
ted— consisting almost entirely of potato-flour.
state that we have found the oatmeal furnished to this Union by
be adulterated with *barley-flour.*

le. — Sample of arrow-root supplied to the Holborn Union.
ted — consisting almost entirely of potato-starch.

examination of the above Table, it appears —

less than Eighteen, or one half the samples, were either adulterated,
some inferior starch, as potato-flour, was substituted for the genuine
-root.

ve of the samples consisted almost entirely of potato-starch.

remaining Thirteen samples consisted of mixtures in various propor-
f potato-starch and sago-powder (these in some cases forming the chief
f the article), with occasionally other starches, as those of tapioca,
, *and curcuma.*

vious Report, we showed that the oatmeal supplied to our unions and
institutions is extensively and systematically adulterated; it now
at the arrow-root is not less extensively and generally deteriorated.
quiries we have made, we do not believe that the slightest blame is
attached to the workhouse authorities in this matter, because we have
l that in the majority of cases such a price is paid for the arrow-root
ensure their obtaining a genuine article.
rdians and governors of unions and public institutions will, we are
ave much reason to thank us for putting them on their guard, and
ir attention to so important a subject.
eve that the majority of the other articles of food supplied to our
s, &c., as coffee, tea, cocoa, mustard, pepper, are also often adulterated
l extent.
which we have now pointed out is one of immense extent and impor-
the several boards of guardians and others should lose no time in
ps to remove it. Fortunately the remedy is simple and efficient. Let
s articles of food supplied on contract be regularly submitted to micro-
amination; this done, we will answer for it, there will soon be an end
adulteration of the food supplied to our unions, workhouses, hospitals,
and other public institutions.
e, in conclusion, to render our thanks to the boards of guardians of
ebone and St. Andrew Holborn Unions for the ready manner in which
led to our request, and forwarded samples of the various articles
the unions under their charge, the first-named board expressing, at
ime, the opinion that the proposal made by us of submitting to micro-
mination all the articles of food furnished to workhouses, &c., "was
to prove of great public utility."

BREAD, AND ITS ADULTERATIONS.

r in the Reports which we published some months since, on Bread an
rations, we gave a list of analyses, and even indicated the streets i

which the samples were purchased, we at that time refrained from making k the names of the bakers from whom they were procured. As all parties had ample notice and warning, we now give the results of additional ana and publish in connexion with them the names and addresses of twent bakers, from all of whom purchases of bread have been made within th few days.

Results of the Chemical and Microscopical Examinations of Tw five Samples of Bread Purchased at the Establishments of Diffe Bakers in the Metropolis.

1*st Sample.* — Purchased of William Grineau, 33. Paddington-street.
Adulterated — containing *alum.*
2*nd Sample.* — Purchased of J. T. Dennis and Co., 87. High-street, Maryle
Adulterated — containing a considerable quantity of *alum.*
3*rd Sample.* — Purchased of W. Fuelling, High-street, Marylebone.
Adulterated — containing a considerable quantity of *alum.*
4*th Sample.* — Purchased of H. Miller, 2. High-street, Marylebone.
Adulterated — containing much *alum.*
5*th Sample.* — Purchased of M. Schlarb, 64. Marylebone-lane.
Adulterated — containing much *alum.*
6*th Sample.* — Purchased of M. Staner, 16. Hinde-street, Manchester-squa
Adulterated — containing much *alum.*
7*th Sample.* — Purchased of W. Jobbins, 3. Thayer-street, Manchester-squ
Adulterated — containing *alum.*
8*th Sample.* — Purchased of Davies and Son, 19. George-street, Portman-sq
Adulterated — containing much *alum.*
9*th Sample.* — Purchased of A. Michie, 33. Edwards-street, Portman-squar
Adulterated — containing a considerable quantity of *alum.*
10*th Sample.* — Purchased of T. Cooper, 173. Tottenham-court-road.
Adulterated — containing a considerable quantity of *alum.*
11*th Sample.* — Purchased of B. Stephens, 75. Tottenham-court-road.
Adulterated — containing much *alum.*
12*th Sample.* — Purchased of F. Pearse, 32. Goodge-street, Tottenham-c road.
Adulterated — containing a very considerable quantity of *alum.*
13*th Sample.* — Purchased of C. T. Wade, 8. Goodge-street, Tottenham-c road.
Adulterated — containing a considerable quantity of *alum.*
14*th Sample.* — Purchased of C. Butler, 2. Goodge-street, Tottenham-c road.
Adulterated — containing a considerable quantity of *alum.*
15*th Sample.* — Purchased of G. Whalley, 27. Cumberland-street, Goo street.
Adulterated — containing *alum.*
16*th Sample.* — Purchased of J. Fortescue, 3. Charles-street, Middlesex Hosp
Adulterated — containing much *alum.*
17*th Sample.* — Purchased of J. Thurgood, 92. Great Tichfield-street.
Adulterated — containing much *alum.*
18*th Sample.* — Purchased of W. Jones, 18. Great Tichfield-street.
Adulterated — containing *alum.*
19*th Sample.* — Purchased of W. Clapperton, 11. Mortimer-street, Cavend square.
Adulterated — containing *alum.*
20*th Sample.* — Purchased of J. L. Bragg, 2. Wigmore-street.
Adulterated — containing a considerable quantity of *alum.*
21*st Sample.* — Purchased of R. P. Cook, 286. Oxford-street.
Adulterated — containing much *alum.*
22*nd Sample.* — Purchased of G. Wordley, 274. Oxford-street.
Adulterated — containing much *alum.*

THE LEAGUE BREAD COMPANY.

This company, from time to time, has put forward advertisements in which it is declared that alum is not employed in the manufacture of the bread sold by it. From one of these the following is copied:—

> "The object for which the above Company was established, and is now in operation, is to insure to the public bread of a pure, wholesome, and nutritious character.
>
> "Experience daily proves how much our health is dependent on the quality and purity of our food; consequently, how highly important it is that an article of such universal consumption as bread should be free from adulteration.
>
> "That various diseases are caused by the use of alum, and other deleterious ingredients, in the manufacture of bread, the testimony of many eminent medical men will fully corroborate.
>
> "Pure unadulterated bread, full weight, best quality, and the lowest possible price."

As the use of alum by bakers is almost constant, and as this substance undoubtedly exercises a prejudicial influence upon the digestive system, and consequently upon health, it became a matter of much importance to ascertain whether the statements made by the Company can be relied on; we therefore have submitted samples of bread, bought at *three* different establishments of the Company, to analysis, with the results given below.

23rd Sample.—Purchased at the Depôt of the League Bread Company, University-street, Tottenham-court-road.

Adulterated—containing *alum.*

24th Sample.—Purchased at the Depôt of the League Bread Company, Charles-street, Middlesex Hospital.

Adulterated—containing *alum.*

25th Sample.—Purchased at the Depôt of the League Bread Company, James-street, Oxford-street.

Adulterated—containing *alum.*

It thus appears that the declaration of the Company, "that the bread sold by it is pure and unadulterated," is incorrect.

At this result of our inquiries we are much surprised, and we regret the circumstance the more, because we had hoped to have had it in our power to inform the public where it might procure that great desideratum, strictly wholesome and unadulterated bread.

It is true that many of the samples examined contained a larger proportion of alum than was discovered in the samples of "League Bread;" but still the amount detected was by no means insignificant or unimportant.

From the above analyses it therefore appears,—

1st. That the whole of the *twenty-five* samples examined, including three sold by the *League Bread Company*, contained *alum.*

2nd. That in none of the samples was *potato* detected.

It will be observed that these results approximate very closely to those of our former analyses, which were,—

1st. That the whole of the *twenty-four samples of bread examined were adulterated with alum.*

2nd. That in *no one of the samples was potato or any other farinaceous matter, other than wheat-flour, detected; nor did any of the breads contain either carbonate or sulphate of lime.*

A point, second only in importance to the purity of bread, is the question of weight. From a number of trials which we have made, we are enabled to state that bread as delivered to houses is almost constantly deficient in weight, and this in many cases, on half and quartern loaves, to the extent of several ounces. See Table, p. 166.

We now make known our intention to publish, in a future article on bread, the names and addresses of bakers who are detected in supplying the public with bread deficient in weight.

We have now shown that many of the bakers of London daily commit at least a double violation of the law, whereby they expose themselves to heavy penalties —first, in selling bread deficient of its proper weight; and secondly, in making use of the forbidden ingredient, *alum*.

The state of the law in reference to these two points is clearly set forth in the following quotation from M'Culloch's "Dictionary of Commerce:"—

"Bakers and others sending out bread in carts, are to supply them with beams, scales, &c., and to weigh the bread, if required, under a penalty of not more than 5*l*. (3 Geo. 4. c. 106. § 8.)

"Bakers, either journeymen or masters, using alum or any other unwholesome ingredients, and convicted on their own confession, or on the oath of one or more witnesses, to forfeit not exceeding 20*l*., and not less than 5*l*., if beyond the environs of London, and not exceeding 10*l*., nor less than 5*l*., if within London or its environs. Justices are allowed to publish the names of offenders. The adulteration of meal or flour is punishable by a like penalty."

CHICORY AND COFFEE, WITH THEIR ADULTERATIONS.

In previous Reports we quoted the observations made by Dr. Pereira in reference to the employment of mineral ingredients, as Venetian-red and reddle, for the purpose of heightening the colour of the roasted and ground chicory-root.

In corroboration of these remarks, we stated that we had detected a red earthy substance in two samples, the results of the examination of which have already been made known.

As, however, it is of great importance, in a sanitary point of view, to determine the extent to which this kind of adulteration is carried, we have instituted some further special analyses.

The evidence of the use of these substances is principally derived from the incineration of a certain quantity of the suspected chicory-powder. All vegetable substances, whether coloured or not, yield, on incineration, a greyish-white ash. The ash of coloured earthy substances, on the contrary, after being burned in a crucible, remains more or less coloured.

As, however, chicory is the root of a plant, and as the earthy matter is but seldom entirely removed from it by washing, the ash of even genuine chicory not unfrequently exhibits, on this account, a slight degree of coloration, being occasionally brownish, or of light-fawn colour. It is only, therefore, when the ash is decidedly coloured, and especially when of a red or rusty-red colour, that the presence of Venetian-red, reddle, or some other analogous substance, is rendered certain.

In these facts, therefore, we have a ready means of determining whether a sample of chicory, or any other vegetable powder, contains an admixture of any mineral colouring matter containing iron, a conclusion which may be further confirmed by chemical analysis.

In the following analyses we have not confined our attention to this one particular, but have made complete analyses of the whole of the samples under examination.

Results of the Microscopical and Chemical Examination of Samples of Chicory obtained of different Manufacturers.

We refrain from publishing the names (except in the instance of proprietary articles) of the manufacturers of the samples of chicory given below, as they were not procured by ourselves direct from the manufacturers, but through other parties.

In Powder.

1st Sample. — *Adulterated* — containing much roasted *wheat-flour*; ash, of a *fawn* colour.

2nd Sample. — Ash, of a *light-fawn* colour.

3rd Sample. — Ash, of a *fawn* colour.

4th Sample. — *Adulterated* — containing roasted *wheat-flour ;* ash, of a *dark-brown* colour, indicating the presence of a large quantity of *oxide of iron.*

5th Sample. — Ash, of a *fawn* colour.

6th Sample. — Ash, of a *light-brown* colour.

7th Sample. — *Adulterated* — containing much *wheat-flour ;* ash, of a *fawn* colour.

8th Sample. — Ash, of a *rusty-red* colour, from the presence of a considerable quantity of *iron.*

9th Sample. — Ash, of a *rusty-red* colour.

10th Sample. — *Adulterated* — with much *wheat-flour ;* ash, of a *rusty-red* colour.

11th Sample. — Ash, of a *light-fawn* colour.

12th Sample. — Ash, of a *deep rusty-red* colour.

13th Sample. — Purchased of W. R. Turner, 267. Oxford-street, in packages, price 2*d.*

"GENUINE
CHICORY POWDER,
A great improvement to Coffee, manufactured from the finest
Hambro-root,
by
TAYLOR BROTHERS."
Ash, of a *rusty-red* colour.

14th Sample. — Purchased of J. Gates, 76. Lisson-grove North, in packages, price 2*d.*

"BARRY AND COMPANY'S
GENUINE
HAMBRO CHICOREE,
A great improvement to Coffee.
GENUINE AS IMPORTED."
Ash, of a *fawn* colour.

15th Sample. — Purchased at the Barbican Steam Mills, 49 Barbican, in packages, price 1½*d.*

"GENUINE CHICORY."

Adulterated — containing roasted *wheat-flour ;* ash, of a *rusty-red* colour.

IN NIBS.

16th Sample. — Ash of incinerated nibs, of a *rusty-red* colour on the surface.

17th Sample. — Ash of incinerated nibs, of a *rusty-red* colour on the surface.

18th Sample. — Ash of incinerated nibs, *white* on the surface.

RESULTS OF THE MICROSCOPICAL AND CHEMICAL EXAMINATION OF SAMPLES OF CHICORY PURCHASED AT THE ESTABLISHMENTS OF DIFFERENT GROCERS IN THE METROPOLIS.

19th Sample. — Purchased of R. Jones, 16. High-street, Borough.
Ash, of a *deep rusty-red* colour.

20th Sample. — Purchased of Newson and Williams, 5. High-street, Borough.
Ash, of a *fawn* colour.

21st Sample. — Purchased of White and Fairchild, 63. High-street, Borough.
Ash, of a *fawn* colour.

22nd Sample. — Purchased of D. Plant, 76. High-street, Borough.
Adulterated — containing roasted *farina ;* ash, of a *fawn* colour.

23rd Sample. — Purchased of White & Company, 107. High-street, Borough.
Ash, of a *fawn* colour.

24th Sample — Purchased of Harrington & Lucas, 113. High-street, Borough.
Ash, of a *rusty-brown* colour.

25th Sample. — Purchased of Rose & Co., 213. High-street, Borough.
Ash, of a *light-fawn* colour.

26th Sample. — Purchased of Brocksopp, Sons, & Co., 234. High-street, Borough.
Ash, of a *light-brown colour.*

27*th Sample.* — Purchased of J. Pringle, 35. Blackman-street, Borough.
Ash, of a *fawn* colour.
28*th Sample.* — Purchased of C. Hart & Co., 4. Newington-causeway.
Ash, of a *yellowish-brown* colour.
29*th Sample.* — Purchased of Horwood & Co., 69. Newington-causeway.
Ash, of a *light-brown* colour.
30*th Sample.* — Purchased of Dannan & Co., 2. Walworth-road.
Ash, of a *dirty-brown* colour.
31*st Sample.* — Purchased of Field & Co., 9. Walworth-road.
Ash, of a *light-brown* colour.
32*nd Sample.* — Purchased of Weller & Co., 14. Crown-row, Walworth-road.
Ash, of a *fawn* colour.
33*rd Sample.* — Purchased of J. Clarke, 8. Crown-row, Walworth-road.
Ash, of a *light-fawn* colour.
34*th Sample.* — Purchased of Fisher & Co., 24. Crown-row, Walworth-road.
Ash, of a *yellowish-brown* colour.

Results of the Microscopical and Chemical Examination of Sampl of Coffee purchased at the Establishments of Different Groce in the Metropolis.

35*th Sample.* — Purchased of Anderton & Co., 26. Old-street, St. Luke's.
Adulterated — consisting principally of *chicory;* ash, of a *greyish-wh* colour.
36th *Sample.* — Purchased of S. Rains, 175. Old-street, St. Luke's.
Adulterated — containing a considerable quantity of *chicory;* ash, of a *greyi white* colour.
37*th Sample.* — Purchased of Mr. Jackson, 21. Goswell-street.
Adulterated — nearly one-half of the sample consisting of *chicory;* ash, of *greyish-white* colour.
38*th Sample.* — Purchased of T. Barber, 104. Goswell-street.
Adulterated — admixed with a considerable quantity of *chicory;* ash, of *greyish-white* colour.
39*th Sample.* — Purchased of Phillips & Co., 37. and 38. Aldersgate-street.
Adulterated — with a considerable quantity of *chicory;* ash, of a *greyish-wh* colour.
40*th Sample.* — Purchased of V. Smith, 53. Aldersgate-street.
Genuine — ash, of a *greyish-white* colour.
41*st Sample.* — Purchased of W. Rhodes, 77. Aldersgate-street.
Adulterated — containing *chicory;* ash, of a *greyish-white* colour.
42*nd Sample.* — Purchased of Lloyd, Hare, & Co., 141. Aldersgate-street.
Adulterated — containing a considerable quantity of *chicory;* ash, of a *reddis yellow* colour.
43*rd Sample.* — Purchased of Betteridge & Co., 152. Upper Whitecross-stree
Adulterated — containing much *chicory;* ash, of a *salmon* colour.
44*th Sample.* — Purchased of A. Dutton, 84. Whitecross-street.
Adulterated — this article consists almost entirely of *chicory;* ash, of a *redd* colour.
45*th Sample.* — Purchased of J. Peppercorn, 89. Whitecross-street.
Adulterated — consisting almost entirely of *chicory;* ash, of a *greyish-wh* colour.
46*th Sample.* — Purchased of J. Thomas, 107. Whitecross-street.
Adulterated — nearly one-half *chicory;* ash, of a *greyish-white* colour.
47*th Sample.* — Purchased of Weldon & Co., 111. Whitecross-street.
Adulterated — with *chicory;* ash, of a *reddish* colour.
48*th Sample.* — Purchased of W. Earl, 128. Whitecross-street.
Adulterated — containing *chicory;* ash, of a *dirty-brown* colour.
49*th Sample.* — Purchased of Stevenson & Co., 159. Whitecross-street.
Adulterated — with a considerable quantity of *chicory;* ash, of a *pale-fa* colour.

mple. — Purchased of W. Turner, 215. Whitecross-street.
terated — containing a considerable quantity of *chicory;* ash, of a *yish-white* colour.

mple. — Purchased of N. Yarrow, 42. King-street, Snow-hill.
terated — nearly one-half the article consists of *chicory;* ash, of a *fawn* our.

mple. — Purchased of Russell & Co., 72. High-street, Borough.
terated — containing much *chicory;* ash, of a *light-brown* colour.

mple. — Purchased of Liquorish & Co., 50. Beech-street, Barbican.
terated — nearly one-half *chicory;* ash, of a *reddish-brown* colour.

mple. — Purchased of Roberts & Co., 31. Barbican.
terated — the greater portion of the article consisting of *chicory;* ash, of *ght-brown* colour.

onclusions to be deduced from the above analyses are as follow: —

That out of the *eighteen* samples of CHICORY procured from manufac- ies, *five* were adulterated with *roasted wheat-flour.*

That several of the samples yielded a coloured ash, indicating the sence of *Venetian Red* or some other analogous ferruginous earth.

That out of the *sixteen* samples of CHICORY purchased at the establish- nts of different grocers in the metropolis, *one* only was adulterated h roasted *farina.*

That the ashes of several of the samples were coloured.

That out of the *twenty samples* of COFFEE submitted to examination, *eteen* were adulterated with *chicory.* The genuine coffee was purchased Mr. Valentine Smith, of 53. Aldersgate-street.

That several of the samples, on incineration, left a coloured residue.

From THE LANCET.

th reference to a portion of the Sanitary Report on Bread and its ations that appeared in THE LANCET of last week, the following adver- t was published by the League Company in the *Times* of Thursday. We esitate to give it a place in our columns. On another and very early we shall return to the subject."

GUE BREAD COMPANY. — The Directors of the Company, having seen LANCET journal of the 25th of Oct. inst. a statement to the effect that s contained in three samples of their bread, think it due to themselves, areholders, and to the public, unequivocally to declare that it is entirely Ever since the commencement of their undertaking, the Directors thfully carried out the principles on which it was founded — viz., the ture and sale of 'Pure Unadulterated Bread.' As the only means tely within their power of refuting the calumny thus cast upon the y, they subjoin a copy of a declaration signed by the whole of the men d in the manufacture of the Company's bread, which is as follows: —

ague Bread Company. — We, the several persons whose names are here- scribed, being the whole of the workmen now and for the last twelve- at least employed by the League Bread Company in the manufacture of ad, do severally, solemnly, and sincerely declare, that having read a t in THE LANCET journal, published on the 25th October, 1851, to the at alum was contained in three samples of the Company's bread, we know tement to be utterly false and unfounded, and we further severally that during the time we have been in the Company's service no alum or leterious ingredient whatever has ever been used or employed in the ture of the Company's bread, and that it is impossible that the same so used or employed without the fact being known to us.'

three agents of whom the bread is stated to have been purchased have ed a declaration that they have never sold any bread but what has been to them by the Company, and expressing their belief that the state- question is untrue.

lications have been personally addressed to three several police magistrates to allow the above declarations to be judicially made by the parties attended for the purpose, but the magistrates, and afterwards a judge at c bers, decided that they had no power to permit them to be made.

"Head Offices, 7. John-street, Clerkenwell, Oct. 29. 1851."

BREAD, AND ITS ADULTERATIONS.

[SUPPLEMENTAL REPORT.]

SINCE the publication of our last Report on "Bread, and its Adulterations, have carefully repeated the analyses of the samples of bread purchased o League Bread Company, of Mr. Clapperton, and of Messrs. Davies and So in the last two instances, at the request of the parties themselves, — and we now to repeat that those analyses were correct, and that the bread in each did really contain alum, and furnished conclusive evidence of the presen that salt.

Believing, nevertheless, that the published declaration and the statemen the above parties, that they do not knowingly use alum in the manufactu their bread, have been made in good faith, we have thought it right to ins further investigations, in order to ascertain whether the presence of alum not be accounted for without supposing that it had been wilfully introduce the bread by the bakers.

With this view, we procured several samples of *flour*, and submitted th analysis, with the following results: —

1st Sample. — Procured at the depôt of the League Bread Company, J street, Oxford-street.

Analysis. — Contains *alum* in small quantity.

Received from Mr. Clapperton, baker, Mortimer-street, Cavendish-squa

2nd Sample. — Stated by Mr. Clapperton to have been purchased of Mr. Po miller, of Stamford Mills, Bedfordshire.

Analysis. — Contains *alum*.

3rd Sample. — Stated by Mr. Clapperton to have been purchased of Mr. Fou miller, Yewsley Mill, Buckinghamshire.

Analysis. — Does not contain *alum*.

4th Sample. — Stated by Mr. Clapperton to have been purchased of Messrs. Brothers, millers, of Southampton.

Analysis. — Does not contain *alum*.

5th Sample. — Stated by Mr. Capperton to have been purchased of Messrs. ney & Wells, millers, Wandsworth, Surrey.

Analysis. — Contains *alum* in small quantity.

Received from Messrs. Davies & Son, baker, George-street, Portman-sq

6th Sample. — Stated by Messrs. Davies & Son to have been purchased of M Stevens & Mercer, millers, Denham, Buckinghamshire.

Analysis. — Contains much *alum*.

7th Sample. — Stated by Messrs. Davies & Son to have been purchased of Hutton, miller, Nine Elms.

Analysis. — Does not contain *alum*.

8th Sample. — Stated by Messrs. Davies & Son to have been purchased of Dives, miller, Mill Wharf, Battersea.

Analysis. — Does not contain *alum*.

We have thus ascertained, from these analyses, the important fact that f the flours used by the bakers who have questioned the accuracy of the an which we published contained alum.

We were led to the examination of the flour, first, in consequence of kn that *alumina*, the base of alum, has been occasionally, though very rarely, covered, in very minute quantity, in *particular descriptions* of wheat; second, because we were fully persuaded that in some cases, the millers, an bakers, introduce alum into the flour, and thus the flour is prepared ready the baker's hands, and his conscience is thereby saved.

Ve next submitted to examination samples of the salt used by Mr. Clapperton Messrs. Davies & Son in the manufacture of their bread; in both of these detected a very small quantity of alumina, with a considerable amount of nbined sulphuric acid. The quantity in Mr. Clapperton's salt were 1·1 per t. of sulphuric acid and about 0·06 per cent. of alumina; and in Messrs. vies & Son's salt, 1·5 per cent. of sulphuric acid and 0·05 of alumina.

Now, as bakers invariably employ salt in the manufacture of their bread, we ve here in many cases an explanation of the *source* of the presence of a very all quantity of alum in bread.

Finding, then, alum in the flour and salt used by Mr. Clapperton, and the me in large quantity in one of the flours received from Messrs. Davies & Son, well as distinct traces in their salt; and lastly, detecting it in small amount the flour purchased of the League Bread Company, we believe these circumances account satisfactorily for the presence of the alum detected in the samples bread purchased of these parties, without supposing that they themselves were ware of its introduction.

It will be remembered that we drew a distinction between the quantities of lum present in the samples of bread purchased of the League Bread Company nd Mr. Clapperton, and those contained in the other breads subjected to nalysis, simply remarking that they did contain alum, without making any tatements as to quantity.

In regard to the League Bread Company, we append the report of a chemist high authority, detailing the results of a second examination of two samples bread purchased of that Company:—

REPORT.

"I have again made a careful analysis of the bread marked No. 1. and No. 2., hich you last forwarded to me, and I have to repeat, as before, that they both ntain alumina. No. 1. contains it in larger proportion than No. 2. Sulphuric id is also detectable, in a very distinct manner, in the solution of the bread.

HENRY LETHEBY, M.B.
Lecturer on Chemistry, London Hospital."

We thus find the accuracy of our original analyses confirmed in every rticular.

It is due to Mr. Clapperton and Messrs. Davis & Son, to notice the fair and aightforward spirit in which they have acted in the matter: they waited upon placed in our hands samples of the flour and salt used by them in the manuture of their bread, and left the investigation entirely to ourselves, stating y felt assured that we should do them full justice. On the publication the first analyses of bread purchased of the League Bread Company the folving letter and declaration was addressed to the editor of THE LANCET:—

E ANALYTICAL SANITARY COMMISSION AND THE LEAGUE BREAD COMPANY.

To the Editor of THE LANCET.

"SIR,—The Directors of the League Bread Company have consulted us on the bject of a statement which appeared in your journal on Saturday last, imputing them the intermixture of alum in their bread. Having from the outset of ir undertaking carefully excluded from their bread the use of alum or other eterious ingredient, they feel greatly surprised and proportionally aggrieved n imputation coming from so influential a journal as THE LANCET, which ributes to them the very act against which they have so sedulously endeavoured guard. The very basis on which their company was established is thus imgned, the ground on which it has claimed the public support is attacked, and ruly attacked, destroyed; and either the directors in their published appeals the public have asserted a deliberate falsehood, or the statement in question is untrue. Unless they have been grossly deceived by their servants or a for which no imaginable motive exists, they know it to be untrue, for as they are individually concerned, they know they have never directly or indi authorised, or connived at, the use of a particle of alum, or other delet ingredient, in a single loaf of bread; and as far as their servants are conc they have unanimously signed a declaration negativing the imputation in of which we forward you a copy. The agents have also signed a declarati which we likewise send you a copy, and we ought to add, that the decla would have been made under the Act of Parliament, which constitut making of a false declaration a misdemeanour, but for the objection magistrates and a judge, to whom applications were addressed to allow th be made.

"We trust, therefore, that, under the circumstances, you will see fit to di or retract the statement made in your paper, and of which our clients com and which, if not withdrawn, is calculated to inflict very great injury upc company.

We are, Sir, your most obedient serva
HODGSON & BU

10. Salisbury-street, Strand. Oct. 31. 1851.

LEAGUE BREAD COMPANY.—"We, the several persons whose names are unto subscribed, being the whole of the workmen now and for the last t months at least employed by the League Bread Company in the manufact their bread, do severally, solemnly, and sincerely declare, that having r statement in THE LANCET journal, published on the twenty-fifth day of Oc one thousand eight hundred and fifty-one, to the effect that alum was con in three samples of the Company's bread, we know such statement to be u false and unfounded. And we further severally declare, that during th we have been in the Company's service, no alum or other deleterious ingr whatever has ever been used or employed in the manufacture of the Com bread; and that it is impossible that the same could be so used or em without the fact being known to us. And we severally make this solemn ration, conscientiously believing the same to be true, and by virtue of th visions of an Act made and passed in the sixth year of the reign of hi Majesty, King William the Fourth, entitled, an Act to repeal an Act present Session of Parliament, entitled, an Act for the more effectual ab of Oaths and Affirmations taken and made in various departments of the and to substitute Declarations in lieu thereof, and for the more entire su sion of voluntary and extrajudicial Oaths and Affidavits, and to make Provisions for the Abolition of unnecessary Oaths.

	Quality of each Declarent.
James Stiff William Watts	Master Bakers.
James Stiff, Jun.	Yeast Brewer.
Henry Leach John Arkell Thomas Roddis John Stiff George White John Bagley	Foremen.
Charles Feedon James Martin Edward Fitzroy Holmes John Moll Edward Harding Robert Giles John Nye Arthur Lyon William Charles	Second Hands.

Witness, T. S. BURTON, *Sol*
10. Salisbury-street, St

League Bread Company. — " We, Eleanor Myers, of 1. University-street, ttenham-court-road, Jane Hyde Burfield, of 10. Charles-street, Middlesex spital, and John Alford, of 46. James-street, Oxford-street, agents respec- ely for more than twelve months last past of the League Bread Company, do erally and solemnly declare that we have never, since we have acted for the d company, sold any other bread than that which has been delivered to us by said company. And we further say, that we believe a statement which has n published in The Lancet journal on the 25th day of October instant, to effect that alum was contained in three samples of bread purchased at our óts, is entirely unfounded. And we severally make this solemn declaration, scientiously believing the same to be true, and by virtue of the provisions an Act made and passed in the sixth year of the reign of his late Majesty king lliam the Fourth, entitled an Act to repeal an Act of the present Session of rliament, entitled an Act for the more effectual abolition of Oaths and Affir- tions taken and made in various Departments of the State, and to substitute clarations in lieu thereof, and for the more entire suppression of voluntary extrajudicial Oaths and Affidavits, and to make other Provisions for the olition of unnecessary Oaths.

Eleanor Myers.
J. H. Burfield.
John Alford."

⁂ "We simply stated that *alum* was present in the bread, and made no im- ation as to *who* put it there. It will be seen elsewhere that we *adhere* to the *uracy* of the Report." — *Ed. of Lancet.*

ISINGLASS, AND ITS ADULTERATIONS.

nglass is the air-bag, or swimming-bladder, sometimes called the sound, various fish, chiefly of the sturgeon tribe, and belonging to the genus *ipenser*.

This bag is a membrane filled with air, situated near the spine, above the ntre of gravity. In most fish it communicates with the œsophagus, or mach, by a duct, which is known as the *ductus pneumaticus;* in others, the ct is imperforate; occasionally there are two sacs, one anterior to the other, d communicating by a short tube.

The air-bag is made up of an external or peritonæal covering, a middle, rous, and in some cases muscular coat, and an internal, highly vascular mbrane.

The following are the principal species of fish from which Russian isinglass is rived: — *Acipenser Huso* or the *Beluga*, *A. Gouldenstadtii* or the *Osseter*, *A. thenus* or the *Sterlet*, *A. Stellatus* or the *Sewruga*, *Silurus Glanis*, and *rinus Carpio*.

n addition to the above, isinglass is obtained in different parts of the world m several other kinds of fish. In New York, from the *Labrus Squeteague*, of tchell. In New England it is procured from the intestines of *Morrhua garis*, or the common cod, this form being denominated *ribbon isinglass*. the Brazils, it is obtained from a large fish, probably a species of *Silurus;* in Iceland, from the *Cod* and *Lota Moloa* or *Ling*.

The Fisheries.

he Caspian and Aral Seas yield the various kinds of the genus *Acipenser* in at abundance; they are also to be found in the waters several hundred miles ond Astrakhan, in the Wolga, Yaik, Don, and even in the rivers as far as eria. The fisheries to the extent of three lazens, or twenty-one feet depth of er, belong to the proprietors of the coast. The Hon. Captain Keppell, in "Travels," describes one merchant as holding thirty fisheries, for one only hich, at Karmaziack, he paid an annual rental of 450,000 roubles.

For the high seas a licence is given, stating the number of boats each fishery is permitted to employ.

The Beluga, *A. Huso*, is caught with harpoons and drawn to the coast. It is taken in the deepest waters of the Caspian Sea, about or beyond one hundred versts from the shore. The fish is a kind of small whale, often exceeds ten or twelve feet, and sometimes reaches twenty-five feet in length, and weighs from one hundred to five hundred English pounds.

Occasionally, on the capture of the beluga, the sounds are immediately removed, to allow of their drying before reaching the shore; in this case, however, the isinglass obtained is inferior to that which is dried on the land The finest and whitest isinglass is that which is prepared on shore, especially where speed is used in cleaning and drying the sounds.

The smaller species are caught in amazing quantities at a less distance from the coast. Captain Keppel, in the volume before quoted, gives a graphic sketch of the manner in which the smaller fish are caught in the fishery of Karmainsk.

"Two persons are in each boat: one, generally a female, rows, while the other hauls in the fish. The instruments used consist of a mallet, and a stick with a large unbarbed hook at the end. Every fisherman has a certain number of lines; one line contains fifty hooks; these are placed at regular distances from each other; they are without barbs, sunk about a foot under water, and are kept in motion by small pieces of wood attached to them.

"The sturgeon generally swims in a large shoal near the surface of the water, and, upon being caught with one hook, he generally gets entangled with one or two others in his struggles to escape.

"Immediately on our arrival, the boats pushed from shore. Each fisherman proceeded to take up his lines. On coming to a fish, he drew it with his hooked stick to the side of the boat, hit it a violent blow on the head with the mallet, and after disengaging it from the other hooks, hauled it into the boat.

"On every side the tremendous splashing of the water announced the capture of some huge inhabitant of the deep."

The sterlet, *A. Ruthenus*, is peculiar to the Wolga, although it is occasionally caught in the Don. The fish is of a brownish colour, having red spots on the sides, and the body shielded by a triple series of hard tubercles.

The sterlet is not very abundant; it is much smaller than the beluga or any other of the genus, and affords isinglass of the first quality. Its roe furnishes "caviare," and the fish is described as the most delicious ever eaten, and is esteemed a favourite dish for the imperial table.

The cost of conveying it to St. Petersburgh, on account of the fish requiring a daily supply of fresh water, is very great. The excessive heat of the weather in July causes a cessation of fishing during that month; the only exception being in favour of the *sterlet*, the fishing for which lasts the whole year round, and which is therefore an article supplied to the various markets for constant consumption.

METHOD OF PREPARATION.

Having thus described the process of capturing the fish, we will now turn to the subsequent preparation.

The fish is brought up to the market-house on the banks of the river, where a clerk is ready to take account of the number caught. Seventy copecks are given for each fish. They are next taken from the boats, with instruments somewhat resembling boat-hooks, and laid in a row. The head of each fish is then split in two, and the caviare and air-bladder immediately separated. The latter is at once slit open, and placed in cold water. After a short time they are cleaned, divested of a certain outside skin or membrane, which envelopes the sounds, nailed to a board, and exposed to the sun to dry. This preparation, however, has reference only to *leaf isinglass.*

That known as *short staple*, *long staple*, and *book isinglass*, has each its distinctive method of preparation.

Short staple is formed of a thin Astrakhan isinglass, which is rolled to something under the thickness of a finger, or cord, and the length varying according to the intended size of the staple. A thin membrane is generally selected for the centre of the roll, round which the rest is folded; about half an inch of each

y being mostly turned inwards; the two ends of the roll are then
ogether, and pinned with a small peg. The middle of the roll being
downwards, the staple assumes a heart shape, and without further
ion it is left to dry.

vey *short staple*, prepared from an inferior isinglass, is likewise im-
—indeed, this description is received in the three forms of *staple*, *leaf*,
k.

ianufacture of *long staple* varies a little from that just described. The
lengthens the staple at will by interfolding the ends of the pieces with
ion ready for twisting. The required dimensions being thus attained,
are fastened together in the same manner, but it is afterward subjected
vier pressure from the middle; then, in order to preserve the shape of
e obtuse angles consequently formed, a cane or stick about a quarter of
in diameter, is fastened in each angle, with small wooden pegs at each
y, to keep them in position. When sufficiently dried to retain their
ie pegs, &c., are removed, and on the drying being completed, the
re colligated in rows by the passing of a string through the peg-holes;
one for the convenience of package and exportation.

inglass known as *book*, is of an inferior quality, and requires far less
ion.

rger bladders, when cut open, cleaned, and partly dried, are merely
p square, in the same manner in which book-folding is conducted—a
ance that points out the origin of its name.

y be asked, why all this evidently useless system of preparation is re-
o, when much expensive trouble might be dispensed with, and the
xported of equal value in its natural and unprepared state?

y be inferred that the system of twisting isinglass into *staples*, or folding
ooks, was originally practised to disguise the article, and keep other
in the dark as to the source of isinglass.

is, however, a kind of isinglass exported from St. Petersburg, which
little or no preparation. This description is taken from the *Silurus glanis*
Siprinus carpio. These produce the kind of isinglass called *purse*.

sists of the sounds or swimming-bladders dried, just as taken from the
ng neither cut open nor folded, but merely dried and collected together,
ing passed through the upper part of each bladder. It is gathered
by certain collectors, and by them brought to the Irbiter fair, held in
and February in each year. It is there bought up by the various
cleaned, and carried to St. Petersburgh, where it arrives during the
of May and July.

ntire quantity of isinglass shipped during the seasons of the past seven
as as follow—viz.,

In 1844 the total amount shipped was 5300 poods.
1845 ,, ,, ,, 4200 ,,
1846 ,, ,, ,, 5100 ,,
1847 ,, ,, ,, 3600 ,,
1848 ,, ,, ,, 3200 ,,
1849 ,, ,, ,, 4900 ,,
1850 ,, ,, ,, 5100 ,,

e above figures it will be seen that the average annual exportation of
from the Russian capital, during the period mentioned, was 4500 poods.
ssian pood being equal to thirty-six English pounds, it follows that
pounds of isinglass, on the average, are shipped every season (a period
asting more than six months), and that in the course of seven annual
31,400 poods were exported, a weight equal to one million, one hun-
l thirty thousand, four hundred pounds.

lition to the isinglass imported from Russia, a vast quantity is annually
from the Brazils, and the East and West Indies. It is, however,
nferior to the descriptions we have noticed. Indeed, *Brazilian isinglass*
it for fining purposes, and for such it is almost wholly bought up by the
ors of large brewing establishments, who consume nearly the entire
imported.

Some of the better kinds of Brazilian isinglass are manufactured in the way as Russian, and sold at a cheaper rate. No doubt, in some instances, is mixed with, or sold as, the best, and it has been ascertained that acids other chemicals have been used to improve the colour of Brazilian isingl but the test of good isinglass is in the jelly made therefrom.

The jelly made from Russian isinglass dissolves readily, furnishes sca any sediment, and is remarkably firm, pure, and translucent.

On the other hand, Brazilian isinglass makes a far inferior jelly, with t remarkable differences: that whilst Russian isinglass is firm, and free deposit, Brazilian isinglass leaves a deposit of insoluble matter amountin twenty or thirty per cent., is less readily dissolved, and the jelly is opales and assumes the appearance of milk.

On making *blanc-mange* with the purest Russian isinglass, milk is need impart the snow-white colour of that jelly; but in the case of Brazilian isingl hot water alone will render it nearly of that colour. It is almost needles add that the *blanc-mange* is much inferior in quality, and the large per- age of insoluble matter renders the jelly proportionately weak.

The quality of any isinglass may easily be tested by dissolving a small por in a glass vessel, with about a table-spoonful of boiling water. The Russian isinglass will instantly dissolve, and scarcely a particle of sediment main; the soluble matter in this article being, according to the best authori ninety-eight grains in every hundred.

The same test applied to Brazilian isinglass will extract the gelatine, but shreds, from their fibrous character, do not entirely dissolve; they turn w and retain their form, unless disturbed, in which case they break up, and f a deposit at the bottom of the vessel.

If Russian isinglass be adulterated with Brazilian, the admixture may c be detected by the insoluble shreds, or white deposit, which is sure to ap in proportion to the amount of Brazilian isinglass that may be introduced. smell of the latter also is strong, far from pleasant, and forms a great cont with the faint, inoffensive, seaweed-like odour of Russian isinglass.

MANUFACTURE OF ISINGLASS.

On the arrival of the isinglass into this country, the best kinds are submi to a course of preparation before they are ready for consumption.

The Beluga leaf is closely examined, and all discoloured parts cut aw the cuttings, and other pieces not deemed good enough for the *best*, are pl aside as *seconds* or *thirds*. These, in some cases, are used for fining better description of ales, but more generally for wines, liqueurs, &c. also rolled and cut into shreds for domestic purposes, where colour is no immediate object.

Purse isinglass is mostly sold to the brewers, who consume a vast quanti the fining of their several beverages.

Long and short staple isinglass is extensively demanded by cider mak confectioners, and others, to whom it is sold in the same state as imported this country.

Leaf isinglass taken from the Beluga, after having been picked fro impure or discoloured pieces, constitutes the very best article, either dietetical use, or for the higher class of clarifying purposes. This descri of isinglass has to undergo a process of manufacture before it is ready for What are termed perfect specimen leaves are nearly round, the bladder ha been opened longitudinally, about two feet in circumference, and weigh eight to sixteen ounces, according to the thickness of the sound. It is uncommon, however, to meet with heavier samples, some having been kn to reach four pounds.

A steam-engine of some eight or ten-horse power is generally used u the present method of preparing isinglass, the adjunct machinery consisti a series of powerful rollers, arranged in pairs in a manner resembling those expressing the juice from the sugar-cane. The rollers when in motio with leaf isinglass as fast as possible, which, in passing between the rs, becomes amalgamated and spread out, and is expelled from the opp side of the rollers in one continuous sheet. The isinglass thus rolled is called "ribbon," but it is not yet ready for the process of cutting.

The sheet or "ribbon" is probably a sixth, eighth, or tenth part of an inch in thickness, and as it is necessary to reduce it until it is as thin as writing-paper, it is passed through rollers more closely set, until, as the thickness diminishes, the desired result is obtained; the width of the "ribbon" of course increasing.

It is to be remarked, that in rolling, the ribbon being confined to the width of the rollers, generally about two feet, increases only lengthways, and when completed, can be folded or rolled up in the same manner as a length of common linen.

After a brief delay, for the purpose of drying, the next and last process of cutting is effected. By the introduction of modern machinery, this part of the preparation of isinglass is performed with surprising celerity, and the material is cut into very fine shreds.

The cutting machine is a cylinder with some five or six keen-edged blades fixed in a tangential direction to the cylinder. The same engine which serves to roll out the isinglass, as already described, suffices to turn this little machine at the rate of some 800 or 1000 revolutions per minute; taking a low estimate, we will suppose it turns 800 times. On examining the cylinder we find five or six blades set in it, and as each of these knives severs a shred from the width of the "ribbon," while the cutting process is going on, it follows that four or five thousand shreds are cut in the short space of one minute.

Such is the plain and simple method of preparing cut isinglass.

There are, however, many consumers who still prefer the old-fashioned style of hand-cut isinglass. In this case, the thin leaf is pulled to pieces with the fingers or divided into strips with scissors, a work mostly performed by women.

The isinglass is of course in much thicker pieces, but nevertheless it is still preferred by some, not on account of its cheapness, as the cost of preparation is much about the same as machine-cut isinglass.

We have now given a general description of isinglass, enumerated the fish from which it is obtained, described the fisheries, the preparation of isinglass, and its manufacture.

From a paper by Dr. Pereira, in the fifth volume of the *Pharmaceutical Journal*, page 66., we learn that the *Samovy* isinglass referred to is obtained from the *Silurus glanis*, the Russian name for which fish is *Som*, whence the word *Samovy* or *Somovy* is no doubt derived.

A difference of opinion has been entertained as to which coat of the air-bladder yields the isinglass. The several layers which enter into the composition of the swimming-bladder, commencing from without, are—1st, a peritonæal coat; 2nd, a middle coat, composed principally of a modification of what is known as white fibrous tissue; and 3rd, an internal epithelial lining.

Bloodvessels ramify through both the external and middle coats, but are most abundant on the inner surface of the latter. These vessels are sometimes described as forming a distinct *vascular* layer. Some also make mention of a *muscular* coat entering into the formation of the air-bladders of certain of the fish from which isinglass is obtained; and it is probable that more or less muscular fibre of the unstriped kind is present in nearly all cases.

Of these coats, the external, or peritonæal covering, is, we believe, usually stripped off; while the internal, which is very thin, and forms but little of the substance of the air-bladder, is also generally removed in the washing and cleansing to which the isinglass is subject; in the case of purse isinglass it is not removed, however. There remains, then, only the *middle* coat; and it is this we believe which furnishes the isinglass—a view entertained by Dr. Pereira, as appears from the second edition of his *Materia Medica*.

The accuracy of this opinion has been, however, called in question by Dr. Edward Martiny, who describes the air-bladder as consisting of only two membranes—an *outer*, strong, shining, and fibrous membrane, and an *inner*, soft, [illegible] ner membrane—namely the mucous membrane"—writes [illegible] ss." T [illegible] description, Dr. Martiny appends the

"Pereira ('Elements of Materia Medica,' vol. ii., second edition, p. 1861.) erroneously regards the middle coat as yielding gelatine."

It appears, from the description of Dr. Martiny, as well as from the above remark, that he has overlooked the epithelial lining altogether, and has not therefore enumerated this as one of the coats of the air-bladder. The "isinglass membrane" of Dr. Pereira, and the "mucous membrane" of Dr. Martiny, there is therefore reason to believe, are one and the same.

The epithelial layer is insoluble in boiling water, and in some instances it is so thick, as in purse isinglass, as materially to deteriorate the value of the article.

When dry, isinglass is transparent, but when immersed in cold water for a few minutes, it becomes white and opaque. Under the microscope, it presents a fibrous structure, which immediately disappears on the addition of dilute acetic acid, the isinglass swelling up, and again becoming very transparent. Examined with the microscope after the action of acetic acid, the walls of the bloodvessels, sometimes the white corpuscles of the blood, and scattered nucleated fibres of fibro-elastic tissue, may be seen.

Now, in all these particulars, isinglass resembles very closely *white fibrous tissue*, a modification of which it is evidently to be considered.

The jelly made even from the best Russian isinglass is, when cold, slightly opalescent. This is due to the presence of a small quantity of albumen. The whiteness of the jelly of *Brazilian* isinglass, which is so remarkable, results from the presence of a much greater amount of albuminous matter.

GELATINE.

Isinglass is made up, to a considerable extent, of the proximate principle, gelatine, which is present in bones, and almost all animal membranes, in large amount. The knowledge of this fact has led to the adoption of numerous processes for the separation of the gelatine.

Now, as gelatine is obtained from these substances, and is extensively employed as a substitute for isinglass, we will, in the next place, proceed to give a description of the preparation of gelatine.

From Pereira's "Materia Medica" we learn that "gelatine is extracted from the bones of the ox and the sheep. It is obtained by boiling bones in water under pressure. It is more readily procured by employing bones which have been previously digested in hydrochloric acid to extract the phosphate of lime. In this way a nutritious soup is prepared in Paris for the hospitals and other pauper habitations. The *patent gelatine* of the shops is obtained, I presume, from bones. It is sold either plain or coloured, and is used as a substitute for isinglass. Gelatine has been extracted from antediluvian bones. A soup was prepared from the bones of the great mastodon by a préfet of one of the departments of France."

In the *London Journal of Arts and Sciences*, a publication which contains the specification of new patented inventions, we find the following description of a patent granted to George Philbrick Swinborne, of Pimlico:—

"The patentee commences his specification by stating that heretofore, in manufacturing gelatine, it has been usual (with one exception) to act on large pieces of hides or skins, and to employ acids and alkalies, together with mechanical and other processes, which occupy considerable time, and are likewise costly; and in the excepted case above referred to, it has been the practice to reduce the pieces of hide into the state of pulp in a paper machine, and then to employ blood to purify the product obtained.

"This invention consists in the following more simple mode of manufacturing gelatine. The patentee takes hides or skins, or parts thereof, as fresh and sweet as possible, and free from hair, and he reduces the whole into shavings or thin slices or films, by any suitable instrument; he soaks the shavings or films for about five or six hours in cold water, and then changes the same; he repeats such changing of the water two or three times each day, until no smell or taste is to be detected, either in the water or in the shavings, and then he removes the shavings from the water. If this product is intended for soup, it is dried on nets, and is then ready for use. If gelatine is to be extracted, the avings, after the above soaking, are put into a suitable vessel, with a quantity water, sufficient to cover them when pressed down, and they are subjected a heat not exceeding boiling water. When dissolved, the gelatine is to be ained through linen or other fabric, subjected to slight pressure with the nds or otherwise, or the solution may be permitted to run off from the vessel thout straining, by which means much of the gelatine will be separated from e fibrous matters. The product of gelatine thus obtained is run in thin films to a smooth surface of slate, or other suitable material, to set; it is then moved on to nets to dry, and when dry it is cut up with an isinglass cutter or er suitable apparatus. The residue, dried or not, may be used for thickening up, and other culinary purposes."

"Another manufacture of gelatinous substances is produced by the following ocess, from cod sounds, or other fishy matters capable of yielding gelatine:— ese matters are reduced to shavings or thin films, soaked in water, subjected the action of heat, and the gelatine strained or run off as above described. e patentee obtains a first, second, and third product of gelatine, which he rms into sheets, and when dry cuts up the same with an isinglass cutter. is manufacture of gelatine will be found highly useful as a cheap substitute isinglass for clarifying liquids."

As gelatine is in many respects inferior to isinglass, is also much cheaper, d as it is sometimes used to adulterate isinglass, and very commonly sold as substitute for it, it becomes of importance that it should be known in what rticulars isinglass and gelatine differ from each other. The distinction we ll next proceed to point out.

Isinglass and gelatine differ very considerably from each other in many of eir characters, and especially in the following:—

The shreds of isinglass, when immersed in cold water, become white, opaque, ft, and swollen.

The swelling of the shreds is equal in all directions, so that, when viewed with low power of the microscope, they appear more or less quadrangular.

In boiling water, they dissolve nearly without residue.

The smell of the dissolved isinglass, when hot, is somewhat fishy, but not npleasant.

The moistened shreds, or the solution, exhibit to test-paper a neutral, or faintly lkaline, and rarely a slightly acid reaction.

Under the microscope, the filaments exhibit a well-marked fibrous structure.

In acetic acid they swell up, and become soft and jelly-like, the greater part of the structure being lost.

Lastly, "The ash which results from the incineration of good Russian isinglass of a *deep red* colour: it contains but a small portion of carbonate of lime, and ever amounts to more than nine per cent. of the isinglass used."*

The shreds of gelatine, on the contrary, when placed in cold water, swell up, cquire increased transparency, and become translucent and glass-like.

The form which the threads take in swelling is peculiar: they do not, like hose of isinglass, swell equally, and remain quadrilateral, but become expanded, at, and ribbon-like, the broad surfaces corresponding to the incised margins.

The dry threads on the uncut surfaces frequently present a peculiar, shining ustre, not unlike that of tinsel.

In boiling water, the shreds do not entirely dissolve, but in most cases a opious deposit falls to the bottom of the glass.

The smell of the hot infusion is like that of glue, and therefore disagreeable.

The moistened filaments, or the solution of gelatine, usually exhibit a strong cid reaction: this in some cases is due to the substances used in bleaching it.

They show no structure under the microscope, but only the marks of the intrument employed in cutting them.

Immersion in dilute acetic acid hardens gelatine.

Lastly, the ash is different from that of isinglass in amount, colour, and comsition. "100 grains of gelatine give from 2·3 to 2·6 grains of ash, which is *hite*, contains much carbonate of lime, with some chlorides and sulphates."—*etheby*.

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* Dr. Letheby, Pharmaceutical Journal, vol. x. p. 127.

Dr. Letheby, who has paid considerable attention to the subject of isinglass, and has drawn up an excellent summary of its chief characters, regards the differences above noticed between the ashes of isinglass and gelatine as very important and distinctive.

It thus appears, that between isinglass and gelatine there are several well-marked distinctions, some of these sufficiently simple to enable the ordinary observer to distinguish for himself the one from the other.

The action of a little cold water on a few of the filaments spread out on glass, is all that is necessary for the discrimination.

Results of the Microscopical Examination of Twenty-eight Samples of Isinglass, purchased at the Establishments of Grocers and Italian Warehousemen resident in the Metropolis.

1st Sample. — Purchased of Brocksopp & Co., 234. High-street, Borough. Price 1*s.* per oz.
Analysis.—Genuine isinglass.

2nd Sample. — Purchased of Harrington & Lucas, 113. High-street, Borough. Price 8*d.* per oz.
Analysis. — Genuine isinglass.

3rd Sample. — Purchased of White & Co., 107. High-street, Borough. Price 8*d.* per oz.
Analysis. — Genuine isinglass.

4th Sample. — Purchased of Russell & Co., 72. High-street, Borough. Price 8*d.* per oz.
Analysis. — Genuine isinglass.

5th Sample. — Purchased of R. Jones, 16. High-street, Borough. Price 10*d.* per oz.
Analysis. — Genuine isinglass.

6th Sample. — Purchased of Mr. Pringle, 35. Blackman-street, Borough. Price 1*s.* per oz.
Analysis. — Gelatine.

7th Sample. — Purchased of Dannan & Co., 2. Walworth-road. Price 1*s.* per oz.
Analysis. — Genuine isinglass.

8th Sample. — Purchased of Field & Co., 9. Walworth-road. Price 1*s.* per oz.
Analysis. — Genuine isinglass.

9th Sample. — Purchased of Horwood & Co., 69. Newington-causeway. Price 1*s.* 4*d.* per oz.
Analysis. — Gelatine.

10th Sample. — Purchased of C. Hart, 4. Newington-causeway. Price 10*d.* per oz.
Analysis. — Genuine isinglass.

11th Sample. — Purchased of Fisher & Co., 24. Crown-row, Walworth. Price 1*s.* per oz.
Analysis. — Genuine isinglass.

12th Sample. — Purchased of J. Clarke, 8. Crown-row, Walworth. Price 1*s.* per oz.
Analysis. — Gelatine.

13th Sample. — Purchased of Hawthorne & Co., 38. Tottenham-court-road. Price 10*d.* per oz.
Analysis. — Gelatine.

14th Sample. — Purchased of Mr. Warton, 13. North Audley-street. Price 1*s.* per oz.
Analysis. — Gelatine.

15th Sample. — Purchased of J. Christmas, 34. South Audley-street. Price 1*s.* 2*d.* per oz.
Analysis. — Gelatine.

16th Sample. — Purchased of Mr. Clifford, 82. Lower Grosvenor-street. Price 1*s.* 2*d.* per oz.
Analysis. — Gelatine.

mple — Purchased of Walker & Co., 21. Goodge-street, Tottenham-
t-road. Price 10*d.* per oz.
is. — Genuine isinglass.
mple. — Purchased of Payne & Sons, 328. Oxford-street. Price 1*s.*
oz.
is. — Genuine isinglass.
ple. — Purchased of R. H. Feltoe, 298. Oxford-street. Price 1*s.* per oz.
is. — Genuine isinglass.
ple. — Purchased of E. Frost, 288. Oxford-street. Price 1*s.* per oz.
is. — Genuine isinglass.
ple. — Purchased of M. Jones, 166. Oxford-street. Price 10*d.* per oz.
is. — Genuine isinglass.
mple. — Purchased of Westbrooke & Co., 21. Oxford-street. Price 1*s.*
oz.
is. — Genuine isinglass.
ple. — Purchased of Hedges & Butler, 155. Regent-street. Price 1*s.* 4*d.*
oz.
is. — Gelatine.
ple. — Purchased of E. Lazenby & Co., 6. Edwards'-street, Portman-
re. Price 1*s.* per oz.
is. — Gelatine.
mple. — Purchased of Fortnum & Mason, Piccadilly. Price 1*s.* 2*d.*
oz.
is. — Genuine isinglass.
ple. — Purchased of W. Holland, 127. Oxford-street. Price 10*d.* per oz.
is. — Genuine isinglass.
ple. — Purchased of Sidney, Manduell, & Wells, 8. Ludgate-hill. In
ets. Price 1*s.* 1½*d.* per oz.

"By her Majesty's Royal Letters Patent.
SWINBORNE'S
PATENT REFINED
ISINGLASS,
Extra quality,
For invalids and confectionary purposes."

is. — Gelatine.

ple. — Purchased of W. Holland, 127. Oxford-street. In sealed packages.
s. 2*d.* per oz.

"VICKERS'
GENUINE RUSSIAN ISINGLASS,
FOR INVALIDS, AND CULINARY USE.

article is guaranteed to be prepared from the pure Russian isinglass, as
, and has not undergone any other process besides being passed through
d cut into shreds, for the purpose of rendering it more soluble. Pur-
ho are desirous of protecting themselves from the *adulteration* which
extensively practised are recommended to ask for "VICKERS' GENUINE
ISINGLASS," *in sealed packets* (containing one ounce, two ounces, a
f a pound, or one pound), that being the surest guarantee for their
taining a really PURE AND UNADULTERATED ARTICLE.
FACTORY, 23. LITTLE BRITAIN, LONDON."

ysis. — Genuine isinglass.

he above Table, it appears that out of the twenty-eight samples of
submitted to examination, *ten, or more than one-third,* of the samples
entirely of gelatine.

e price of the genuine isinglass varied from 8*d.* to 1*s.* 4*d.* per ounce;
t of the gelatine ranged between 10*d.* and 1*s.* 4*d* per ounce.

s isinglass is very different from gelatine in many of its properties, and
undoubtedly much the superior of the two, it is evident, from these
that the public are seriously imposed upon and injured by the substi-
isinglass of such an article as *gelatine.*

There is one adulteration of isinglass, which we believe to be not unfrequ practised—viz., the incorporation of different amounts of gelatine witl genuine isinglass. On this subject we may have some remarks to offer future occasion.

VINEGAR, AND ITS ADULTERATIONS.

General Remarks on Acetification.

Acetic acid is the volatile principle, to the presence of which, diluted variable proportions of water, vinegar owes its aroma and pungency.

This acid exists, ready formed, in notable quantity in certain plants, as *bucus niger* or *black elder*, *Phœnix dactylifera* or *Date tree*, and *Rhus typhe*

It may be readily generated by the fermentation of various vegetable animal substances, especially the former.

For commercial purposes it is made from certain vegetable and spirit infusions, as those of the grape, malt, and the sugar-cane; but any veget infusion capable of yielding alcohol will also, when exposed to the neces conditions, furnish vinegar. In most cases, and indeed whenever vinega manufactured on a large scale, the vinous or alcoholic fermentation precede acetous, and the vinegar is formed entirely at the expense of the alcohol.

But the conversion of alcohol into acetic acid, it is said, ought not t regarded as essential to acetification, since some vegetable and animal infus become sour, from the formation of acetic acid, without any previous genera of alcohol.

Acetic acid may be formed directly from the vapour of crude alcohol or sp of wine in communication with the atmosphere, through either an ig platinum wire, or by means of the black powder obtained by boiling pt chloride of platinum and potash with alcohol. In Germany, where the pri alcohol is very low, vinegar has been manufactured on a large scale on principle. The process is thus described by Dr. Ure:—

"Under a large case, which for experimental purposes may be made of g several saucer-shaped dishes of pottery or wood are to be placed in rows shelves over each other, a few inches apart. A portion of the black pla powder, moistened, being suspended over each dish, let as much vinous sp be put into them as the oxygen of the included air shall be adequate to aci This quantity may be inferred from the fact, that 1000 cubic inches of air oxygenate 110 grains of absolute alcohol, converting them into 122 grain absolute acetic acid, and sixty-four grains and a half of water.

"The above simple apparatus is to be set in a light place (in sunshi convenient), at a temperature of from 68° to 86° Fahr., and the evaporatio the alcohol is to be promoted by hanging several leaves of porous paper in case, with their bottom edges dipped in the spirit. In the course of a minutes a most interesting phenomenon will be perceived. The mutual a of the platina and the alcohol will be displayed by an increase of tempera and a generation of acid vapours, which, condensing on the sides of the case, trickle in streams to the bottom. This striking transformation conti till all the oxygen of the air be consumed. If we wish then to renew the cess, we must open the case for a little, and replenish it with air. With of twelve cubic feet in capacity, and with a provision of seven or eight ounc platina powder, we can in the course of a day convert one pound of alcohol pure acetic acid, fit for every purpose, culinary or chemical. With from tw to thirty of the platina powder (which does not waste), we may transform nearly 300 pounds of bad spirits into the finest vinegar. Though our rev laws preclude the adoption of this elegant process upon the manufacturing in this country, it may be regarded as one of the greatest triumphs of chem where art has rivalled nature in one of her most mysterious operations."

ertain conditions are either essential to acetification, or else promote greatly rapidity of the process; thus the presence of atmospheric air is one of the litions indispensable to the change, the reason of which is made apparent by subjoined formulæ: —

ne atom of alcohol consists of

$$C_4 H_5 O + H O;$$

ne atom of anhydrous acetic acid of

$$C_4 H_3 O_3.$$

ow, one atom of alcohol absorbs four atoms of oxygen from the air, to n one atom of anhydrous acetic acid, and three atoms of water — a change ch is thus explained by chemical symbols.

$$C_4 H_6 O_2 \text{ and } 4 O = C_4 H_3 O_4 \text{ and } 3 H O;$$
$$\text{or } C_4 H_5 O + H O \text{ and } 4 O = H O, C_4 H_3 O_3 + 2 H O.$$

ıs, when alcohol is converted into acetic acid, two of the atoms of the oxygen directly absorbed to form the acid, and the remaining two atoms convert two ms of the hydrogen of the alcohol into water; the atom of water of the bhol and the two fresh atoms of water produced are all retained, and form a ydrate of acetic acid.

uch are the changes, by atom, of alcohol into acetic acid.

t is therefore evident that much of the success of any process adopted for the nufacture of vinegar will depend upon the manner in which the mother liquor xposed to the atmosphere — that is, upon the constant renewal of the air, and extent of surface exposed to its action, the conversion of alcohol into acetic d taking place only on the surface of the liquid.

The knowledge of the fact that atmospheric air is indispensable to acetifiion explains why wine and beer, which, when inclosed in air-tight vessels, lergo no change, as soon as they are exposed to the air, rapidly pass into the tous fermentation.

second necessary condition is the presence of a substance capable of iting fermentation — that is, a ferment.

n vegetable infusions, as those of the grape and malt, the nitrogenised princles contained in them, chiefly gluten, act as the ferment. Vinegar itself, egar yeast, lees, beer yeast, leavened bread, and many other similar matters, of which contain gluten, are capable of exciting fermentation, and so proting the generation of acetic acid. Experience has shown that the best ment for inducing the transformation of alcohol into acetic acid is a portion ready-made vinegar itself.

A third condition, which, though not, like the former, essential, yet greatly stens the conversion, is an increased temperature, varying considerably in ferent cases, but sometimes reaching as high as 100° Fahr.

When any spirituous liquor is exposed under the conditions requisite for etification, the following phenomena are observed to occur in succession.

However clear the liquid may have been at first, it quickly becomes turbid, rrents or movements are soon visible in it; it is said, in common language, to e "on the work." Slimy particles collect on the surface, gradually forming a um, and which, after a time, falls as a sediment to the bottom. The Germans all this scum "vinegar mother," since it is capable of exciting acetification in esh portions of liquid. During the process the temperature of the liquid rises, nd the peculiar aroma of vinegar becomes diffused in the surrounding air; as oon as all the alcohol has become converted into acetic acid, the temperature lls to that of the atmosphere, the motion ceases, the liquid becomes clear and right, and its conversion into vinegar is complete.

THE DIFFERENT KINDS OF VINEGAR, AND THEIR MANUFACTURE.

The four principal kinds of vinegar met with in commerce are — *wine vinegar*, *alt vinegar*, *sugar vinegar*, and *wood vinegar*. The first three of these depend on fermentation, and result from the change of alcohol into acetic acid; while od vinegar is obtained without the intervention of fermentation, by the structive distillation of wood.

Not unfrequently more than one substance is combined in the manufacture of vinegar; thus, mixtures of malt, corn, and sugar or treacle are occasionall employed; in which case the resulting vinegar is of course a combination of tw or more kinds of vinegar.

In some parts of England vinegar is made from either *cider* or *perry;* thes kinds are distinguished by the presence of malic acid.

Distilled vinegar may be obtained by the distillation of any kind of vinegar what is commonly sold however as this, is generally nothing more than dilute acetic acid, and in some cases even pyroligneous acid.

Wine Vinegar. — The room in which this description of vinegar is manufactured is usually constructed for the especial purpose; the walls are built o brick, the roof is low, and the apartment provided with a number of holes, b which the air can be constantly renewed, and which admit of being more or les closed, according to the external temperature and the state and direction of th wind; while the heat of the room is maintained at a uniform degree by means o either flues or hot-water pipes. In France these fermenting rooms are calle *vinaigraires*, and have always a southern aspect, so that they may receive th influence of the sun.

The process of fermentation is carried on in casks; these are placed in row one above the other, the acetification being soonest complete in the highest row in consequence of the greater degree of heat in the upper part of the chamber.

The casks are laid horizontally, and pierced at the upper part of their fron end with two holes; one of these, named the *eye*, is two inches in diameter, an serves for charging the cask, and for drawing off the vinegar when made; th other is much smaller, and is merely for the escape of air.

When new vessels are employed, they must be filled to one-third with goo vinegar, which acts as the ferment, or *mother*, to the wine subsequently adde to it.

"At the ordinary rate of work," says Dr. Ure, "they put at first upon th mother, which occupies one-third of the vessel, a *broc* of ten litres of red o white wine; eight days afterwards they add a second *broc;* then a third and fourth, always observing the same interval of time — eight days. After thi charge they draw off about forty litres of vinegar, and then recommence th successive additions."

The cask should always be about one-third empty, to admit freely of th action of the air; but as tartar and lees gradually accumulate, it become after a time, necessary to clean out the casks and to commence afresh; thi however, is usually not required until after the casks have been in use for abou ten years.

As the process of the conversion of wine into vinegar is not always accomplished in a given time, it is necessary, before drawing off the vinegar, to te it, and ascertain whether the conversion is complete. For this purpose a whi rod is introduced into the liquor, and then drawn out in a horizontal directio If it be covered with a thick white froth, it is judged that the operation is complete; but if the wort be red, the process is considered to be incomplete.

The temperature of the fermenting room, Dr. Ure states, is constantly ke up, by wine vinegar makers, from 75° to 77° Fahr.

The wine, before being added to the casks, itself usually undergoes a proce of clarification. For this purpose it is poured into a cask filled with chips beechwood; the impurities, termed lees, are arrested by the chips, and the wi passes off quite clear.

In some cases, when this precaution has not been observed, and especia when the wine itself is weak, it often becomes requisite to clarify the vineg this is effected usually in the same manner, but sometimes a small quantity isinglass is employed instead.

The wine vinegars are made principally in the wine-growing countries France and Germany. Most of the French wine vinegar which makes its into this country is manufactured at Bordeaux and Orleans.

It is, when pure and of good quality, the best description of vinegar; i liable, however, to adulteration with pyroligneous acid. It is sometimes voured by the addition of wine, and is distinguished from all other vineg by the presence of bitartrate of potash, called simply tartar or wine-sto The presence of the alcohol increases its aroma and pungency.

According to the above-described method, the process of acetification extends er several weeks before it is complete. A system has been devised, however, rapid, that the conversion is effected often in a few days. This important sult is obtained by the peculiar construction of the fermenting vessels, whereby immensely extended surface of the liquor is exposed to the action of the air. e shall presently describe this process more fully.

Malt Vinegar. — The chief part of the vinegar made in this country is pre-red from malt, or malt and corn mixed either with or without sugar; the llowing is the process as described by Dr. Ure. "One boll of good barley alt, properly crushed, is to be mashed with water at 160° Fahr.; the first ter should have that temperature; the second must be hotter than 160°; and e third water, for the extraction of all the soluble matter, may be boiling hot. pon the whole, not more than 100 gallons of wort should be extracted. After e liquor has cooled to 75° Fahr., three or four gallons of beer yeast are poured and well mixed with a proper stirrer. In thirty-six or forty hours, according the temperature of the air and the fermenting quality of the wash, it is racked into casks, which are laid upon their sides in the fermenting apartment of vinegar work, which should be kept at a temperature of 70° at least; in sum-er, partly by the heat of the sun, but in general by the agency of proper stoves, above described. The bung-holes should be left open, and the casks should t be full, in order that the air may act over an extensive surface of the liquor. would be proper to secure a free circulation to the air, by boring a hole in ch end of the cask near its upper edge. As the liquor, by evaporation, would generally a few degrees colder than the air of the apartment, a circulation of would be established, in at the bung-hole, and out by the end-holes. By ordinary methods, three months are required to make this vinegar market-le, or fit for the manufacture of sugar of lead."

"In making vinegar for domestic purposes, the casks are usually set on their ds, and they have sometimes a false bottom pierced with holes, placed about foot above the true one. On this bottom a quantity of *rape*, or the refuse sins, &c., from the making of British wines, is laid. The malt liquor has a oper quantity of yeast added to it. In about twenty-four hours it becomes rm, and is then racked off into another similar cask. After some time this king process is discontinued, and the vinegar is allowed to complete its mentation quietly. The proper temperature must always be kept up, by cing the cask in a warm situation. A little wine-stone (*argol*) added to the lt-wash, would make the vinegar liker that made from wine. Sometimes a tle isinglass is employed to clarify vinegar. A portion of sulphuric acid is en added to it."

Sugar vinegar. — "By pursuing the following plan, an excellent sugar negar (states Dr. Ure) may be made. In 158 quarts of boiling water dissolve n pounds of sugar, and six pounds of wine-stone; put the solution into a rmenting cask, and when it is cooled to the temperature of from 75° to 80° ahr., add four quarts of beer yeast to it. Stir the mixture well, then cover the ssel loosely, and expose it for six or eight days to the vinous fermentation, at temperature of from 70° to 75° Fahr. When it has become clear, draw off he vinous liquor, and either acetify it in the graduation-tub above described, or y the common vinegar process. Before it is finished we should add to it twelve uarts of strong spirits (brandy), and fifteen quarts of good vinegar, to complete he acetous fermentation. With a graduation-tub which has been used, this ddition of vinegar is unnecessary."

The following simple directions for making sugar vinegar deserve at-ention: — "For every gallon of hot water, take eighteen ounces of sugar; nd when the syrup has cooled to 75°, add four per cent., by measure, of yeast. hen the vinous fermentation is pretty well advanced, in the course of two or ree days, rack off the clear wash from the lees into a proper cask, and add ne ounce of wine-stone, and one of crushed raisins, for every gallon of water. xpose it in a proper manner, and for a proper time, to the acetifying process, d then rack off the vinegar, and fine it upon beech chips. It should be terwards put into bottles, which are to be well corked.

"Vinegar obtained by the preceding methods has always a yellowish or wnish colour. It may be rendered colourless by distillation. For nicer chemical purposes, this is done in a glass retort; but on a large scale usually performed in a clean copper still, furnished with a capital and refrigeratory, either of silver or block-tin."

Wood Vinegar.—Wood vinegar is made, as already observed, by t structive distillation of certain kinds of wood.

The rationale of the formation of the acetic acid is as follows:—

The water is first driven off in the form of vapour; the various consti of the wood, as the fibre, albumen, &c., are decomposed into their u elements, carbon, hydrogen, oxygen, and nitrogen; these elements r and form, by their combination, a variety of totally different compou water, carbonic acid, carburetted hydrogen, carbonic oxide, and pyroli acid, which consists of a portion of the carbon of the wood, in unio oxygen and hydrogen.

The proportions of these several products vary, not only with the nature wood, but particularly with the degree of heat employed. Towards the the process, the carbon being predominant, empyreumatic oil, of a dark and laden with that substance, will pass over.

The apparatus employed in this country for the manufacture of wood vi consists of large iron cylinders, placed horizontally in a furnace; the mities project a little beyond the brickwork of the furnace; "one end disc or round plate of cast-iron, well fitted, and firmly bolted to it, from the of which disc an iron tube, about six inches in diameter, proceeds, and en a right angle, the main tube of refrigeration; the diameter of this tube from nine to fourteen inches, according to the number of cylinders. Th end of the cylinder is called the mouth of the retort; this is closed by a iron, smeared round its edges with clay lute, and secured in its place wedges. The charge of wood for such a cylinder is about eight cwt woods used are principally those of the oak, ash, birch, and beech. T is kept up during the daytime, and the furnace is allowed to cool duri night. Next morning the door is opened, the charcoal removed, and charge of wood is introduced. The average product of crude vinegar, pyroligneous acid, is thirty-five gallons."

The manufacture of pyroligneous acid is sometimes carried on in con with the preparation of gunpowder, as a matter of economy. Charcoal e so largely into the composition of gunpowder, the pyroligneous acid during the reduction of the wood to the state of charcoal, is, by some n carefully collected, although others suffer it to go to waste.

THE QUICK VINEGAR PROCESS.

According to the old and usual method of making vinegar by exposi alcoholic mixture to the air in casks, several months elapse before the ac tion is complete, and a great loss of alcohol and of acetic acid of course It therefore became an important desideratum in the manufacture of vin invent some process whereby this long period might be shortened and w material lessened.

With this object in view, and remembering that the great impediment t acetification was the slow and imperfect manner in which the oxygen of was supplied to the liquid to be acidified, it occurred to the late Mr. Norwich, that if he could succeed in feeding the liquid more effectua quickly with oxygen, that the process of acetification would be greatly a thereby, and a considerable saving of material effected. He therefore co an apparatus by which the alcoholic solution was made constantly to pas in a shower of drops, layers formed either of chips or faggots of beech- great extent of surface of liquid being thus continually exposed to the ac the atmosphere. The actual and practical results of this method of pro fully equalled those which, from theory alone, might have been anticipat

In the work of Dr. Ure already quoted, 1st edition, we meet with the fo description of the fermenting vessels, and of the process of acetificatio the "quick vinegar work," as practised in Germany:—

"An oaken tub, somewhat narrower at the bottom than the top, fro seven feet high, and three feet in diameter, is furnished with a well grooved, but loose cover. About half a foot from its mouth, the tu strong oak or beech hoop fitted to its inside surface, sufficiently firm to support a second cover, also well fitted, but moveable. The space under this second cover is destined to contain the vinous liquor; and in order to bring it very amply into contact with the atmosphere, the following contrivances have been resorted to: — This cover is perforated, like a sieve, with small holes, of from one to two lines in diameter, and about an inch and a half apart. Through each of these holes a wick of packthread or cotton is drawn, about six inches long, which is prevented from falling through by a knot on its upper end, while its under part hangs free in the lower space. The wicks must be just so thick as to allow of the liquor poured above the cover passing through the holes in drops. The edges of the lid must be packed with tow or hemp, to prevent the liquor running down through the interval.

"The whole lower compartment is now to be filled with chips of beechwood up to nearly the perforated cover. The liquor, as it trickles through the holes, diffuses itself over the chips, and sinking slowly, collects at the bottom of the tub. The chips should be prepared for this purpose by being repeatedly scalded in boiling water, then dried, and imbued with hot vinegar. The same measures may also be adopted for the tub. To provide for the renewal of the air, the tub is perforated, at about a foot from its bottom, with eight holes, set equally apart round the circumference, two-thirds of an inch wide, and sloping down, through which the air may enter into this lower compartment, without the trickling liquor being allowed to flow out. In order that the foul air which has become useless may escape, four large holes are pierced in the sieve-cover, at equal distances asunder and from the centre, whose united areas are rather smaller than the total areas of the holes in the side of the tub. Into these four holes open glass tubes must be inserted, so as to stand some inches above the cover, and to prevent any of the liquor from running through them. This air may afterwards pass off through a hole of two inches and a half diameter in the uppermost cover, in which a funnel is placed for the supply of liquor as it is wanted to keep up the percolation.

"The temperature of the fermenting compartment is ascertained by means of a thermometer, whose bulb is inserted through a hole through its side, and fastened by a perforated cork. The liquor collected in the under vessel runs off by a syphon inserted near its bottom, the leg of which turns up to nearly the level of the ventilating air-pipes before it is bent outwards and downwards. Thus the liquor will begin to flow out of the under compartment only when it stands in it a little below the sieve-cover, and then it will run slowly off at the inclined mouth of the syphon, at a level of about three inches below the lower end of the glass tubes. There is a vessel placed below upon the ground to receive it. The tub itself is supported upon a wooden frame, or a pier of brick-work, a foot or eighteen inches high."

Dr. Ure*, in a later edition of his work, gives the following description of the apparatus originally employed by Ham.

"This is a wooden vat or vessel about 12 feet in height, and from 7 to 8 feet in diameter, closed at top and bottom, except at the openings for the introduction of the wash and the exit of the vinegar. The sides are perforated by a few small holes for the admission of air, and within are three floors or partitions perforated with numerous holes for the passage of the wash through them. Upon these floors are laid bundles of birch-twigs, to favour the dispersion and division of the fluid which passes through the acetifier, and is thus brought into the most intimate contact with the oxygen contained in the vessel, or admitted through the openings in its sides. The fluid or wash is of course admitted at the top of the acetifier, and suffered to trickle slowly through the masses of birch-twigs, and through the partitions, thus causing a rapid absorption of oxygen and consequent production of vinegar, which, with any undecomposed wash, flows out at the bottom of the vessel, and is again pumped up to the top, and so on, until the process is finished."

But a very great improvement upon the processes as above described consisted in the adaptation of steam machinery, as in the extensive vinegar works of Messrs. Hill, Evans, & Co., of Worcester, where we recently had the opportunity of seeing the improved process in full operation.

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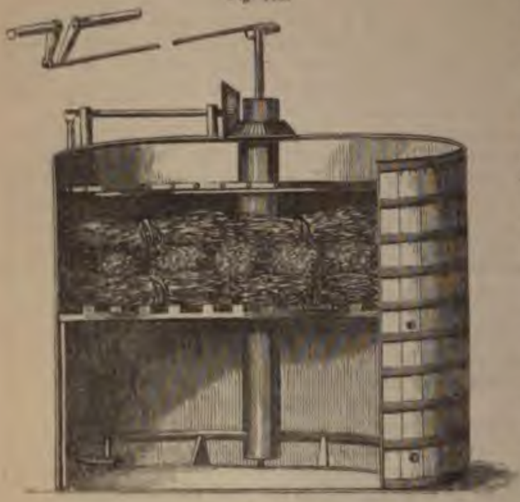
* Dictionary, 4th edition.

In the manufactory of the firm above named the process is conducted i vats capable of each holding from 6,000 to 10,000 gallons of wash; each va filled with the liquid to be acidified, and the upper half with bundles of birc as are in general use for brooms or besoms. The pump in the centre elev liquor, and, by means of its rotative motion, disperses it in a shower o surface of the bed of and in descending t the same it is met by ascending current of spheric air, which, in contact with the plied surfaces of th trickling through th speedily acidifies whole being kept u proper heat by a ste of pure tin passing t the vat. The acidi is generally compl twenty days, but v inverse ratio to the tion of birch to the be acidified; and th operation, mechani chemical, being pe by steam, no manua of any kind is re save the occasional tion of the manage certain when the pr finished.

Fig 113.



Acetifier Model.

This apparatus is capable of acidifying any fermented liquor whatev even distilled spirit, with a complete control over any waste.

The process will be more clearly comprehended by an examination accompanying engraving, which was made from a model prepared by Hill, Evans, & Co., and shown at the Great Exhibition.

The upper circular opening in the side of the vat is for the admission o spheric air, the lower is the termination of the steam pipe. It should b tioned that the principle of the process was discovered quite independent about the same time, in Germany. Mr. Ham patented his process, wh been employed for many years by Messrs. Hill, Evans, & Co.

The Adulteration of Vinegar.

The principal adulterations of vinegar are: —

Dilution with water; the addition of sulphuric acid; the substitution o ligneous for acetic acid; the use of burnt sugar as a colouring agent, an sionally the addition of acrid substances, as chillies and grains of Paradis

The presence of sulphuric acid in British vinegar is not in itself to be re as an adulteration, since the addition of one part to a thousand is permi law. It is only when the quantity present exceeds this, that it is to be con as constituting an injurious and illegal adulteration.

Vinegar made from malt is apt, when kept for any length of time, to u decomposition, and it is in order to prevent this putrefactive tendency, t addition of a small amount of sulphuric acid has been allowed. Nevert it is questionable how far this acid is necessary for the preservation o made vinegar, since it is not contained in wine-vinegar, and since some manufacturers dispense with it, or any other analogous acid, altogether, preparation of their home-made malt vinegars. It is to the poorer and vinegars especially that this acid is most largely added.

Whether sulphuric acid is capable of exerting an injurious action on th of the stomach in the small proportion of one part in a thousand, may be d there can be no question that when contained in vinegar in large amount it ts a prejudicial effect.

e have found some samples of vinegar to consist of little else but sulphuric , coloured with burnt sugar: it is in low coffee-houses and oyster-stalls, that vinegar is not uncommonly met with.

ll the deep-brown and red British vinegars owe the greater part of their ur to the presence of burnt sugar. We are surprised that manufacturers uld desire to increase the colour of their vinegars by such means, as we uld have thought that depth of colour would have been no recommendation, that their object would rather have been to keep their vinegars as pale as sible, so that they might resemble in tint pale amber sherry, a colour much re agreeable to the eye than the deep, heavy brown of ordinary vinegar.

It is in the stronger vinegars principally that acetic and pyroligneous acids found, but nearly all the weak and lowest class vinegars are adulterated th the latter acid, some samples indeed consisting entirely of dilute pyroligous acid coloured.

Other adulterations described in books, but which are certainly of very unquent occurrence, consist in the addition of nitric, hydrochloric, and tartaric ds, alum, common salt, spurge flax, mustard seeds, pellitory root, and long pper.

As in the preparation of acetic acid, and distilled vinegar, copper stills, lead, c, or tin pipes are sometimes, though by no means commonly used, vinegar is asionally found to be contaminated to a dangerous extent with those metals. vinegar is capable of acting very energetically, in the course of a few minutes, most metals, their use in its manufacture ought to be strictly prohibited: ny fatal accidents have resulted from the impregnation of vinegar with metallic sons. The metal which is however most frequently found in vinegar is iron.

On the Determination of the Amount of Acetic Acid present in Vinegar.— e amount of acetic acid present in vinegar is ascertained by saturation h known quantities of an alkali.

The acid may be first separated from the other constituents, impurities, or lterations of the vinegar, by distillation; being volatile, it passes off on the lication of heat, and is thus procured not only separately, but also in a more centrated form. The quantity of vinegar to be employed is half a pint, ich should be distilled almost to dryness; the acid obtained then being tralised, and its amount thus determined.

The process of distillation, however, is tedious, and does not admit of easy lication, except in the laboratory of the chemist. The same end can be ined by a different method; thus, the alkali may be added directly to the egar. The alkali usually employed is soda; it may be used either in the form the pure crystals of carbonate, the recently-ignited carbonates of soda, which preferable, or a solution of caustic soda may be prepared by means of caustic e. The dried carbonate is prepared by submitting any of the carbonates, in a cible, to the action of the fire. The whole of the water of crystallisation uld be driven off, and the white powder left heated to redness.

Weighed quantities of the soda should be dissolved in known bulks of distilled ter. In this way the re-agent may be applied in even decimal portions of a grain.

Further, it is not only necessary to prepare such a solution, but also to have means of employing this in definite minute quantities, an object which is cted by an instrument termed an alkalimeter.

An alkalimeter is an elongated and graduated glass tube, terminating above two apertures, the one large, by which the instrument is replenished, and the er small, and drawn out into a point to regulate the escape of the fluid in ps. The instrument which we employ is one of Griffin's septimal alkalime; the scale is marked into ten principal divisions, which are again subdivided ten lesser degrees or spaces, each of which is denominated a "septem," m its being made to contain seven grains of distilled water. The entire asure, therefore, holds, as will be perceived, seven hundred grains of distilled er.*

An improved alkalimeter of Mohr is now made by Mr. Griffin, by means of which definite quantities of olution may be added with greater accuracy.

In many chemical works, we are directed to mix a few drops of a solution of litmus with the vinegar, previous to using the soda solution, add this until the colour of the reddened litmus is restored. These dir are erroneous, and lead to serious miscalculations, for the litmus does no become blue until the saturating point has been long passed, and the liq acquired a decided alkaline reaction; we therefore recommend the opera to rely upon the indications afforded by the solution of litmus.

Again: we are told to continue adding the soda solution until the litmus immersed in the vinegar ceases to turn red. There is here a source o equally great as in the former case, for the litmus-paper will be reddene after the acetic acid has been neutralised, this arising from the disengag bonic acid of the soda absorbed and retained by the fluid.

This fallacy is guarded against by repeatedly drying, in the course of t cess, the litmus-paper before the fire or the flame of a candle, when, redness be due to carbonic acid, it will vanish on the application of th but if to acetic acid, it will be permanent. Other ways of guarding aga fallacy arising out of the presence of free carbonic acid is to heat the and so expel the acid, or to set it aside for a few hours and thus allow escape of the carbonic acid. The saturation is complete, then, when the paper neither retains the *slightest shade* of redness, nor has its blue tin least degree heightened, this latter indicating of course alkalinity. By however, of the solution of caustic soda the source of fallacy arising ou disengagement of carbonic acid is avoided. The great objection to the solution is, that it very quickly absorbs carbonic acid, and therefore will for any length of time.

Mr. Mitchell, in his treatise on the Falsification of Food, states,— a drop or two of pure vinegar be placed upon blue litmus-paper, the la be reddened; but when dried before a fire, the red colour disappears, original blue again presents itself."

Although, from the volatile character of acetic acid, it might be infe this statement was correct, we have yet found that the redness produce acid is not dissipated by the degree of heat which is employed to dry th paper, but on the contrary remains fast.

The strength of the solution should be determined by atom: one atom of the recently-ignited carbonate of soda corresponds to, and will satu atom of, anhydrous acetic acid.

The soda should be added to the water in the proportion of six equiv one hundred grains of distilled water. If a pound of the solution be the same weight of water should be poured into a white glass bottle, th the liquid in the vessel being exactly ascertained and marked; the bott then be emptied, the soda dissolved in a portion of the water, and retu the bottle, the remaining water being added up to the mark previous and any water that may be over being rejected.

An ammonia solution is free from the objections attached to the s carbonate of soda, when the precaution pointed out with respect to the litmus-paper is not strictly observed.

It is extremely difficult, however, to obtain a definite solution of and when procured, to maintain it of uniform strength. Mr. Griffin, of Square, perceiving the advantages of the ammonia solution, proposes t it in such a manner as entirely to obviate these objections. An ingen has been devised for noting loss of strength in a solution of ammon nicely-balanced beads are immersed in it: the one, so long as the is of the proper strength, remains at the bottom, but gradually ascen liquid becomes heavier; the other lies just under the surface of and of course emerges from it, and makes its appearance above, under circumstances.

Some experimenters determine the amount of acetic acid by weig quantity of carbonic acid evolved. This method requires a special a and it is questionable whether, unless very carefully employed, it g accurate results as the soda solution.

There is one process for the determination of the amount of acid in ch may be briefly noticed, less from its intrinsic value, than from the ingenuity ched to it.

weighed and perfectly dry piece of marble or chalk is to be introduced a known quantity of vinegar; the acid of the vinegar acts upon a portion ither of these, forming a soluble acetate of lime; the remaining marble or k is then to be removed, carefully washed in distilled water, redried, and its ght again ascertained; the loss indicates the amount of acetic acid present.

ill be observed that there is one great objection to this process as applied to analysation of vinegar containing sulphuric acid; since the surface of the ble or chalk becomes coated with a crust of sulphate of lime, which impedes, do not altogether prevent, the action of the acetic acid.

convenient quantity of vinegar to be operated upon is 500 grains.

n the Determination of Sulphuric Acid in Vinegar.—Sulphuric acid, as we e said, is very commonly added to the malt and other vinegars made in this ntry, ostensibly for the purpose of making it keep the better, but also unstionably to augment its strength.

e have already expressed doubts as to whether this addition is at all neces- to well-manufactured vinegar, since some makers dispense with it altogether; however, the law has allowed of the addition of a certain amount of sulphuric , the presence of this can hardly be treated as an adulteration, although ctly it really is so. By it the acidity of the vinegar is not only increased, but cost of the article much reduced, and in place of a volatile and aromatic d, such as is natural to the gastric juice, we are made to consume a sh mineral acid, having none of these properties, and in no way concerned digestion.

Several statements are contained in books which treat of adulterations, reecting the detection of sulphuric acid in vinegar. Thus it is said:—

First. If a pen be charged with vinegar containing sulphuric acid, and words itten with it, when dried before the fire, they turn black.

Second. When such vinegar is dropped on paper, the spots also become black en dried.

Third. That towards the conclusion of the evaporation of a portion of vinegar taining sulphuric acid, dense fumes of sulphureous acid will be evolved, and residuum charred.

ourth. If a drop of the vinegar be allowed to fall into a hot solution of cane-ar, an intense black spot will instantly appear, resulting from the carbonisa- of the sugar.

ifth. That starch or dextrine being boiled in vinegar containing sulphuric , will be converted into glucose, or grape-sugar.

hese methods, although specious, are but little applicable, in practice, to the stion of the adulteration of vinegar with sulphuric acid, since we have never with any samples containing so large a proportion of the acid as to give any he indications referred to.

he presence of sulphuric acid, and its amount, may be determined by means solution of chloride of barium, prepared in the same manner as the soda tion; every 2·4 parts of the crystals of chloride of barium correspond to one of commercial sulphuric acid. The solution should be made very weak, so as to contain more than 1·2 of the crystals of chloride of barium in one hundred ns of distilled water—a quantity which represents half a grain of commercial huric acid.

ive hundred grains of vinegar should be poured into a tall precipitating glass, the solution added in minute portions of a grain, so long as any precipitate . The vinegar should be well agitated after each addition, and an interval ree or four hours must elapse, to allow of the subsidence of the sulphate of ta, before a fresh quantity of the solution be added. A more exact method add excess of the solution, the precipitated sulphate of baryta being col-d, ignited, and weighed.

ut as sulphuric acid in the combined state exists in all vinegars, even the st, usually in minute quantity only, although occasionally, where gypseous r has been employed in the manufacture, in considerable amount, it is er in all cases to determine whether the acid be *free* or *combined*, as, of course, it only constitutes an adulteration when in the free state. The combined sulphates present in vinegars are derived partly from the grain and partly from the water employed. Whether the acid be free or combined may be ascertained in the following manner. If the liquid remains acid after the removal of the acetic acid by distillation, the acidity is most probably due to free sulphuric acid, the amount of which must be ascertained thus:—

A given quantity of the vinegar is first precipitated with chloride of barium, in order to get the total quantity of sulphuric acid present.

A similar quantity is evaporated to dryness, incinerated, and the white ash, after treatment with a few drops of nitric acid, tested for sulphuric acid. If the acid is in the combined state there will be no difference in the proportions obtained in the two cases.

Further: the quantity of acid contained in the vinegar before and after distillation may be determined, and if the results agree, we obtain additional evidence of the absence of free sulphuric acid.

Another way is to evaporate the vinegar to the consistence of a syrup, and to separate the free sulphuric acid by means of alcohol, and then to proceed to determine its amount in the usual way.

On the Detection of Metallic Impurities in Vinegar.—Ten ounces of vinegar should be evaporated to dryness in a porcelain capsule, and the residue reduced to a white ash; if the ash be brown or rust-coloured, in place of white, it contains iron. The ash should be treated with a few drops of pure nitric acid, distilled water being added after the lapse of a few hours; the solution should be filtered, and a portion of it tested with sulphuretted hydrogen. If it turn black, the vinegar most probably is contaminated with lead; if dark brown, with copper; and if yellow, with tin. If there be no change of colour, it may be concluded that no metallic substance is present. It is proper, however, not to rely for the determination of the metal present upon the colour of the liquid, but to test for that, the presence of which is suspected, by the appropriate reagents.

Results of the Chemical Analyses of Thirty-three Samples of Vinegar of various kinds, purchased for the most part of different Oilmen, Publicans, and Grocers, resident in the Metropolis.

In order that the purport of the analyses about to be given may be better comprehended, we shall preface them with a few explanatory observations.

The quantity of sulphuric acid, or oil of vitriol, as already noticed, permitted to be added to vinegar, for the avowed purpose of making it keep, is one part in a thousand. But sulphuric acid, as met with in commerce, is by no means of standard or uniform strength, but is diluted with variable quantities of water.

The sulphuric acid indicated in the analyses, is what is termed monohydrated sulphuric acid, which is in general very much stronger than the commercial acid; every part of the former, therefore, corresponds to a much larger quantity of the latter.

Again, it should be particularly remembered that the acidifying power of the mineral sulphuric acid is very much greater than that of the vegetable acetic acid: one part of sulphuric acid acidifies a much larger quantity of a fluid than the same amount of acetic acid, so that the sulphuric acid present in vinegar does not simply take the place of a similar quantity of acetic acid, but represents several times the amount of that acid.

Although the method of obtaining the amount of sulphuric acid in vinegar, by precipitation with a solution of chloride of barium of known strength, when carefully applied, furnishes tolerably satisfactory results, yet where it is desirable to determine exactly the total amount of sulphuric acid present in a considerable quantity of vinegar, a different method may be adopted with advantage.

To half a pound or more of the vinegar, a concentrated solution of chloride of barium should be added in excess; the precipitate is to be collected on a filter, the weight of the ash of which is known, burned in a platinum crucible, and the sulphate of baryta carefully weighed; 27·19 parts of the powder represent 11·44 parts of monohydrated sulphuric acid. It will be seen that in some cases we have followed this method of analysis for sulphuric acid. For estimating the ntity of free and combined sulphuric acid we must proceed by the methods ribed on the previous page.

inegars are made by the manufacturer of several different strengths, and sold ourse at corresponding prices. These are distinguished by certain numbers, os. 16, 17, 18, 20, 22, and 24, the strength increasing with the numbers; these numbers do not usually afford any exact indication of the real strength he vinegars; and hence at least one firm does not use them to distinguish several qualities, but employs the letters A, B, C, D, E, and F, taking care scertain by analysis that these letters invariably correspond to certain defi- strengths. This system is the same as that to which we particularly adverted former occasion, in our "Report on Mustard," in which it was shown that mustard-maker prepared no less than four different qualities of mustard, "fine," "seconds," "superfine," and "double superfine,"—the fine, by the y, indicating the worst or lowest quality.

lthough we believe it is the universal custom of the manufacturer to adopt system, yet it is open to great objections from the facility it affords for imsition, by the substitution of an article of inferior quality for the superior.

It is generally stated that good vinegars, such as all Nos. 24 ought to be, ould contain *five per cent.* of anhydrous or pure acetic acid. It will be seen, m the analyses, that this percentage is for the most part too high, probably ing to the inaccurate manner in which the soda test for ascertaining the acetiing power is usually applied.

The No. 24 vinegars, at the time that a duty was levied on the article, were en by the excise as standards, and hence they have been called "Revenue of vinegars."

In order, therefore, to judge of the quality of the vinegars sold in the shops, s necessary to institute certain preliminary analyses of vinegars of different ds and strengths, to serve as standards of comparison. This we have done.

It is to be regretted that the specific gravity of the several samples of vinegar jected to analyses was not ascertained, as this affords in many cases an exlent and simple means of arriving at a tolerably correct conclusion as to quality. The stronger the vinegar is, of course the greater is its specific vity. No. 24 vinegar of good quality should have a specific gravity of not than 1022; No. 22 of 1020; No. 20 of 1019; No. 18 of 1017; and No. 16 1015.

FRENCH WINE VINEGAR.

Sample.—Vinaigre de Bordeaux.— Imported by Messrs. Kent and Sons, Upton-on-Severn.

nalysis.— Smell, refreshing, aromatic; taste, pungent, vinous, and agreeable; 1000 grains contain 51·02 parts of *pure acetic acid*, which is equal to upwards of 5·10 *per cent.;* traces only of *combined sulphuric acid*, and a small quantity of *bitartrate of potash*, or *wine-stone*.

e may here observe, that when dried carbonate of soda is added in considere quantity to genuine wine-vinegar, it undergoes a remarkable change of our, becoming dark and inky; this forms an excellent test, and one which wered well when applied to the above vinegar.

Sample.— Vinaigre d'Orleans.

nalysis.— 1000 grains contain 34·69 parts of *acetic acid*, or 3·46 *per cent.;* a small quantity only of *combined sulphuric acid* and *bitartrate of potash*.

t will be perceived that there is a great difference in the strengths of these vinegars; the first contains upwards of one and a half per cent. more of real d.

VINEGAR MADE FROM MALT, CIDER, AND TREACLE.

Messrs. Kent & Sons, Nos. 17 to 24 inclusive.

Sample.—No. 17.

nalysis.— 1000 grains contain 31·39 grains of *acetic acid*, or 3·13 *per cent.;* traces only of *combined sulphuric acid*.

Sample.— No. 18.

nalysis.— 1000 grains contain 34·69 grains of *acetic acid*, or 3·46 *per cent.*

5th Sample.— No. 20.

Analysis.— 1000 grains contain 36·41 grains of *acetic acid*, or 3·64 *per cent.*

6th Sample.— No. 22.

Analysis.— 1000 grains contain 38·14 grains of *acetic acid*, or 3·81 *per cent.* traces of *combined sulphuric acid.*

7th Sample.— No. 24.

Analysis.— 1000 grains contain 39·88 grains of *acetic acid*, or just 4 *per cent.*

It will be observed that the last five samples contain no free sulphuric acid, but traces only in a state of combination, derived entirely from the ingredients out of which the vinegars were made, and yet these vinegars are bright to the eye, sharp to the taste, and show not the least tendency to change. We deem this to be an important fact, and hope that it will lead vinegar-makers to try whether they cannot adopt a process of manufacture by which the use of sulphuric acid may be altogether dispensed with.

MALT VINEGARS.

8th Sample.— Standard, No. 24.

Analysis.— 1000 grains contain 36·86 grains of *acetic acid*, or 3·68 *per cent.* and 3·62 grains of *free sulphuric acid* in the 1000 grains.

3500 grains, or half a pound of this vinegar, chloride of barium having been added in excess, furnished a precipitate of sulphate of baryta, which, when well dried, weighed 37·82 grains, a quantity which contains 15·91 grains of mono-hydrated sulphuric acid.

It will be noticed that this vinegar, while it is not greatly deficient in acetic acid as compared with sample 7, yet contains four times the amount of sulphuric acid formerly authorised by the excise authorities, and of course much more than is required to make it keep.

9th Sample.— Standard No. 24.

Analysis.— 1000 grains contain 46·26 grains of *acetic acid*, or 4·62 *per cent.*, nearly 5 parts in the 100; and traces of *combined sulphuric acid.*

10th Sample.— Standard No. 24.

Analysis.— 1000 grains contains 43·24 grains of *acetic acid*, or 4·32 *per cent.* and 1·28 of *sulphuric acid* in 1000 parts.

SAMPLES PURCHASED OF DEALERS IN THE METROPOLIS.

11th Sample. — Purchased of W. Perrin, Oilman, 42. New Church-street, Paddington.

Analysis.—1000 grains contain 36·49 grains of *acetic acid*, or 3·64 *per cent.*, and ·68 of *sulphuric acid.*

12th Sample.— Purchased of W. Simpson, Oilman, 1. Portman-place, Edgware-road.

Analysis.— 1000 grains contain 41·99 parts of *acetic acid*, or 4·19 *per cent.*, and traces of *combined sulphuric acid.*

13th Sample. —Purchased of R. Goodman & Co., Grocers, 52. Crawford-street.

Analysis.— 1000 grains contain 38·73 parts of *acetic acid*, or 3·87 *per cent.*, and 2·56 of *sulphuric acid.*

14th Sample.—Purchased of B. Harvey, Oilman, 53. Crawford-street.

Analysis.— 1000 grains contain 36·20 grains of *acetic acid*, or 3·62 *per cent.*, and ·97 or nearly one grain of *sulphuric acid.*

15th Sample.—Purchased of W. Gilbert, Oilman, 58. Crawford-street.

Analysis.— 1000 grains contain 23·84 parts of *acetic acid*, or 2·38 *per cent.*, and 2·31 of *sulphuric acid* in 1000 grains, the amount of acid having been determined in this case from the quantity of sulphate of baryta precipitated on the addition of chloride of barium.

16th Sample.—Purchased of J. Marden, Grocer, 88. Lisson-grove.

Analysis.— 1000 grains contained 39·23 grains of *acetic acid*, or 3·92 *per cent.*, and traces only of *combined sulphuric acid.*

17th Sample. — Purchased of J. Edmonds, Grocer, 49. Seymour-place.

Analysis.— 1000 grains contain 24·05 parts of *acetic acid*, or 2·40 *per cent.*, and 1·66 parts of *sulphuric acid* in 1000 parts.

18th Sample.—Purchased of Mr. Chambers, Grocer, 39 A, Upper Seymour-street.

sis.— 1000 grains contain 35·10 parts of *acetic acid*, or 3·51 *per cent.*, traces of *combined sulphuric acid.*

nple. — Purchased of J. Williams, Oilman, 33. Upper Seymour-street.

sis. — 1000 grains contain 22·92 parts of *acetic acid*, or 2·29 *per cent.*, 1·05 grains of *sulphuric acid* in 1000 parts.

ple.—Purchased of J. Owtram, Italian Warehouseman, 6. Edgware-road.

sis.— 1000 grains contain 46·61 parts of *acetic acid*, or 4·66 *per cent.*, ·88 of *sulphuric acid* in 1000 parts.

nple.—Purchased of E. B. Minton, Publican, 17. Edgware-road.

sis.— 1000 grains contain 35·01 parts of *acetic acid*, or 3·50 *per cent.*, 3·15 of *sulphuric acid* in 1000 grains, the amount of acid having been rmined in this case from the quantity of sulphate of baryta precipitated he addition of chloride of barium.

mple.— Purchased of H. Gooch, Publican, 55½. Edgware-road.

sis.— 1000 grains contain 41·29 grains of *acetic acid*, or 4·12 *per cent*, traces of *combined sulphuric acid.*

mple.— Purchased of J. Compton, Publican, 84. Edgware-road.

sis.— 1000 grains contain 41·29 parts of *acetic acid*, or 4·12 *per cent.*, traces of *combined sulphuric acid.*

mple.— Purchased of J. Veal, Oilman, 103. Edgware-road.

sis.— 1000 grains contain 41·92 parts of *acetic acid*, or 4·19 *per cent.*, ·84 of *sulphuric acid.*

nple.— Purchased of John Williams, Oilman, 104. Edgware-road.

sis. — 1000 grains contain 26·35 parts of *acetic acid*, or 2·63 *per cent.*, 2·56 of *sulphuric acid.*

rains, or half a pound of this vinegar, chloride of barium having been excess, furnished a precipitate of sulphate of baryta, which, when well eighed 27·19 grains, a quantity which contains 11·44 grains of mono- l sulphuric acid.

nple.— Purchased of J. Gill, Publican, 28. Edgware-road.

sis.— 1000 grains contain 31·83 parts of *acetic acid*, or 3·18 *per cent.*, 1·81 of *sulphuric acid.*

nple.— Purchased of T. Whatmore, Publican, 5. Edgware-road.

sis. — 1000 grains contain 29·45 grains of *acetic acid*, or 2·94 *per cent.*, 4·37 of *sulphuric acid.*

rains, or half a pound of this vinegar, chloride of barium having been excess, furnished a precipitate of sulphate of baryta, which, when well eighed 38·69 grains, a quantity which contains 16·27 grains of mono- l sulphuric acid.

mple.— Purchased of Hardstaff & Co., Grocers, 104. Edgware-road.

sis.— 1000 grains contain 25·61 of *acetic acid*, or 2·56 *per cent.*, and 3·30 ins of *sulphuric acid.*

nple.— Purchased of J. & W. Mullins, Publicans, Edgware-road.

sis.— 1000 grains contain 27·70 parts of *acetic acid*, or 2·77 *per cent.*, 1·21 parts of *sulphuric acid.*

mple.— Purchased of G. Mills, Oilman, 124. Edgware-road.

sis.— 1000 grains contain 37·27 parts of *acetic acid*, or 3·72 *per cent.*, 1·96 or just two grains of *sulphuric acid.*

nple.— Purchased of H. & J. Wilshin, Oilmen, 133. Edgware-road.

sis.— 1000 grains contain 46·05 parts of *acetic acid*, or 4·60 *per cent.*, ·88 of *sulphuric acid.*

mple.— Purchased of R. Lowe, Publican, 134. Edgware-road.

sis.— 1000 grains contain 41·71 parts of *acetic acid*, or 4·17 *per cent.*, ·88 of *sulphuric acid.*

mple.— Purchased of Harvey & French, Italian Warehousemen, 227. ord-street.

sis. — 1000 grains contain 48·10 parts of *acetic acid*, or 4·81 *per cent.*, ·75 of *sulphuric acid.*

ill now arrange the above analyses in a tabular form, so that they may readily understood and contrasted : —

TABLE SHOWING THE RESULTS OF THE ANALYSES OF THIRT THREE SAMPLES OF VINEGAR.

Sample.	Name.	Dried Carbonate of Soda required to neutralise 1000 Grains.	Pure Acetic Acid in 1000 Grains.	Acetic Acid, Per Cent.	Crystallised Chloride of Barium to precipitate the Sulphuric Acid in 1000 Grains.	[illegible]
1	Vinaigre de Bordeaux.	52·94	51·02	5·10	- -	tr
2	Vinaigre d'Orleans.	36·00	34·69	3·46		
3	Kent and Sons, No. 17.	32·57	31·39	3·13		
4	Ditto „ 18.	36·00	34·69	3·46		
5	Ditto „ 20.	37·80	36·41	3·64		
6	Ditto „ 22.	39·60	38·14	3·81		
7	Ditto „ 24.	41·40	39·88	3·99		
8	Standard 24.	42·00	36·86	3·68	9·01	
9	Ditto.	48·00	46·25	4·62	- -	t
10	Ditto.	46·20	43·24	4·32	3·00	
11	W. Perrin.	37·17	36·49	3·64	1·71	
12	W. Simpson.	43·57	41·99	4·19	- -	tr
13	R. Goodman.	42·85	38·73	3·87	6·37	
14	B. Harvey.	37·17	36·20	3·62	2·42	
15	W. Gilbert.	27·14	23·84	2·38	5·73	
16	J. Marden.	40·71	39·23	3·92	- -	tr
17	J. Edmonds.	25·71	24·05	2·40	4·12	
18	Mr. Chambers.	36·42	35·10	3·51	- -	tr
19	J. Williams.	24·88	22·92	2·29	2·61	
20	J. Owtram.	49·28	46·61	4·66	2·20	
21	E. B. Minton.	36·60	35·01	3·50	7·77	
22	H. Gooch.	42·85	41·29	4·12	- -	tr
23	J. Compton.	42·85	41·29	4·12		
24	J. Veal.	45·00	41·92	4·19	2·09	
25	John Williams.	30·00	26·35	2·63	6·37	
26	J. Gill.	35·40	31·83	3·18	4·50	
27	T. Whatmore.	35·10	29·45	2·94	10·87	
28	Hardstaff and Co.	30·00	25·61	2·56	8·22	
29	J. W. Mullins.	30·00	27·70	2·77	3·01	
30	G. Mills.	40·71	37·27	3·72	4·87	
31	H. & J. Wilshin.	47·14	46·05	4·60	2·20	
32	R. Lowe.	43·28	41·71	4·17	2·20	
33	Harvey and French.	51·42	48·10	4·81	1·87	

By the attentive consideration of the above analyses, several important clusions may be arrived at. Thus it will be seen: —

1st. That the amount of acetic acid, the most important constituent of vin varies greatly in different samples, the highest per-centage being 5·10 the lowest 2·29, or less than half the first amount.

2nd. That, since the standard No. 24 vinegars, submitted to analysis, for the most part considerably over four per cent., vinegar to be de good ought to contain certainly *not less* than four per cent. of real acid

3rd. Judged by this standard, out of twenty-three samples of vinegar purcl of dealers in London, seven reached this strength, and contained from per cent. upwards of acetic acid; the per-centage of seven of the vin ranged between three and four, while in the remaining nine the amou acid varied from two to three per cent., it being in two instances — sa 17 and 19, the weakest of the whole,—as low as 2·40 and 2·29.

4th. That twelve samples out of the thirty-three analysed contained n sulphuric acid — a fact affording convincing proof that the use of this so objectionable in many respects, is not necessary for the preservati well-made vinegar.

5th. That in eight samples the quantity of sulphuric acid present did n ceed the amount formerly permitted to be added.

6th. That in the remaining cases the amount exceeded this, and in so stances was three or four times as great.

7th. Since the manufacturers prepare and sell vinegar of different qual some being very weak, and, as the analyses have shown, and is also known, they frequently add sulphuric acid, it is clear that the blame o present unsatisfactory condition of the article lies with them, althoug doubt, in some cases the retailer as well takes his part in the work of teration and deterioration, by the addition of water and further quanti sulphuric acid.

It will be remembered, that in our Report on this subject, we expressed our viction that sulphuric acid is not necessary to the preservation of well- ufactured vinegar, in proof of which we cited the example of Messrs. Kent Sons. It now appears that there are other parties who sell vinegar free from contamination with sulphuric acid.

' *The Declaration of W. Smethurst, of the firm of Wilkinson and Smethurst.* William Smethurst, of the firm of Wilkinson and Smethurst, Vinegar British Wine Merchants, Nag's Head buildings, High-street, Borough, thwark, do solemnly and sincerely declare, that the samples of 16, 18, 20, 22 vinegar, left with the Editor of THE LANCET on Monday, Feb. 2. 1852, *bonâ fide* samples of the vinegar we have been, and are, sending out to our tomers, free from sulphuric acid and all other adulterations.

"And I make this solemn declaration, conscientiously believing the same to true, and by virtue of the provisions of an Act made and passed in the sixth ar of the reign of his Majesty King William the Fourth, intituled 'An Act to eal an Act of the present session of Parliament, intituled An Act for the re effectual abolition of Oaths and Affirmations taken and made in various de rtments of the State, and to substitute Declarations in lieu thereof, and for more entire suppression of voluntary and extrajudicial oaths and affidavits, to make other provisions for the abolition of unnecessary oaths.'

"Declared at Southwark Police Court, in the county of Surrey, this 5th day February, 1852, "W. SMETHURST.

"Before me,

"G. A. A'BECKETT."

"We have submitted the samples of vinegar referred to in the above affidavit, well as others, purchased of parties supplied by Messrs. Wilkinson and ethurst, to careful examination, and now make known the results of the lyses, for the sake of the public, the honest trader, and as an act of justice the merchants by whom the article is supplied.

"The vinegars are clear and bright, sharp, pungent, and aromatic; they con- n no free sulphuric acid, and in proportion to their respective qualities are of siderable strength.

"It thus appears that Messrs. Wilkinson and Smethurst, as well as Messrs nt and Sons, are honourably distinguished in selling vinegars free from so rious an admixture as oil of vitriol."

t will be seen by reference to our Second Report on Vinegar and its Adul- ations that several other manufacturers, as well as Messrs. Kent and Sons, Messrs. Wilkinson and Smethurst, do not use sulphuric acid in the preparation of their vinegars, and are therefore equally favourably distinguished.

PICKLES, AND THEIR ADULTERATIONS.

persons unacquainted with the subject, the title of this report, "Pickles their Adulterations," may appear somewhat singular; and they may be osed to ask — Are not the girkins, cabbages, beans, &c., which we see in the les, what they appear to be? And are other vegetables than those commonly wn to us mixed with the ordinary kinds? To these questions we thus y:— "Girkins," on close examination, often turn out to be but shrivelled sliced cucumbers; the "young tender beans" to be old and tough; the uliflowers" to have run to seed; and the "red cabbage" to be nothing more white cabbage turned into red by colouring matter, as a dyer would change colour of a dress; further, that amongst the vegetables not unfrequently loyed for the purpose of pickle-making are some which do not enter into the ulation of the epicure, as vegetable marrows,—which, when cut into pieces, n a very respectable imitation of cucumbers,—and sliced turnips, the identi- tion of which would be apt to puzzle even a botanist, as well as certainly all e who are uninitiated in the secrets of a pickle-manufactory.

But the adulterations to which we more especially allude, and to the consideration of which our attention will be particularly directed in the following remarks, are those which refer to the quality and composition of the vinegar used for pickling, as well as to the means employed for preserving and heightening the colour of green pickles.

In Accum's celebrated work, "Death in the Pot," under the head Poisonous Pickles, we obtain the following information in relation to the "greening" of pickles: —

"Vegetable substances preserved in the state called pickles by means of the antiseptic power of vinegar, whose sale frequently depends greatly upon a fine lively green colour, and the consumption of which, by seafaring people in particular, is prodigious, are sometimes intentionally coloured by means of copper. Girkins, French beans, samphires, the green pods of capsicum, and many other pickled vegetable substances, oftener than is perhaps expected, are met with impregnated with this metal. Numerous fatal consequences are known to have ensued from the use of these stimulants to the palate, to which the fresh and pleasing hue has been imparted according to the deadly *formulæ* laid down in some modern cookery books; such as boiling the pickle with halfpence, or suffering them to stand for a considerable period in brazen vessels."

Dr. Percival (*Medical Transactions*, vol. iv. p. 80.) has given an account of "a young lady who amused herself while her hair was dressing with eating samphire pickles impregnated with copper. She soon complained of pain in the stomach, and in five days vomiting commenced, which was incessant for two days. After this her stomach became prodigiously distended, and in nine days after eating the pickles death relieved her from her suffering."

Among many recipes which modern authors of cookery books have given for imparting a green colour to pickles, the following are particularly deserving of censure; and it is to be hoped that they will be suppressed in future editions of the works from which they are extracted: —

"*To pickle Girkins.*[*] — Boil the vinegar in a bell-metal or copper pot; pour it boiling hot on your cucumbers.

"*To make Greening.*[†] — Take a bit of verdigrise the bigness of a hazel-nut, finely powdered, half-a-pint of distilled vinegar, and a bit of alum powder, with a little bay salt. Put all in a bottle, shake it, and let it stand till clear. Put a small tea-spoonful into codlings, or whatever you wish to green."

Mr. E. Raffeld directs: "To render pickles green, boil them with halfpence, or allow them to stand for twenty-four hours in copper or brass pans."[‡]

"To detect the presence of copper, it is only necessary to mince the pickles, and to pour liquid ammonia, diluted with an equal bulk of water, over them in a stopped vial: if the pickles contain the minutest quantity of copper, the ammonia assumes a blue colour."

The above remarks and quotations convey a somewhat fearful picture of the colouring of pickles. It will be our object to ascertain how far the statements made apply to their present condition.

It will be seen that the same method of analysis for determining the amount of acetic acid has been followed which was adopted in the Report on Vinegar; and that the sulphuric acid has in all cases been determined by the quantities of sulphate of baryta formed on the addition of an excess of chloride of barium.

As the *combined* sulphuric acid by this process, as well as that which is *free*, are thrown down, it becomes necessary to ascertain the quantity of sulphuric acid in the state of combination present in genuine vinegar. With this view we have analysed different samples, of 1000 grains each, of pure vinegar, and obtained the following amounts of sulphate of baryta: — from Kent's Bordeaux, ·61 hundredths of a grain; Kent's No. 17., ·57; and from Gilbert's pickling vinegar, ·46 hundredths; the first corresponding with ·25; the second with ·24; and the third with ·19 hundredths of sulphuric acid. In all calculations, therefore, the average quantity of combined sulphuric acid should be deduced from the total amount of that acid present. In some few instances where very hard well waters are used in making the vinegar it will be necessary to test separately for the combined and free sulphuric acid, as directed in the Report on Vinegar.

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[*] The Ladies' Library, vol. ii. p. 203.

[†] Modern Cookery; or, the English Housewife, 2nd edition, p. 94.

[‡] The English Housekeeper, pp. 352, 354. This book has run through 18 editions.

Lastly, for the detection of the copper the following processes were adopted: About 3 oz. of the green vegetables of each of the pickles, after having been sed with a glass knife, were incinerated, care being taken to avoid every source contamination: the ash, having been pulverised, was treated with 20 drops pure nitric acid; 1 oz. of distilled water, after the lapse of a short time, was led, the solution filtered, and treated with excess of ammonia; if copper was sent, the solution became more or less blue, according to the amount of the tal present.

The results obtained by the above method were also, in all cases, confirmed by econd process.

SULTS OF THE CHEMICAL ANALYSIS OF TWENTY SAMPLES OF PICKLES OF DIFFERENT KINDS PURCHASED OF VARIOUS PICKLE-MAKERS AND OTHER TRADESMEN IN LONDON.

MIXED PICKLES.

Sample.—Purchased of E. H. Wood, Italian warehouseman, 88. Oxford-street.

Analysis.—1000 grains of the *vinegar* in which the pickles were preserved contain 19·37 parts of *acetic acid*, or 1·93 per cent., and 1·67 of *sulphuric acid; pickles* themselves impregnated with *a very considerable quantity of copper*, evidenced both by the *blue colour* of the solution of the ash on the addition of ammonia, as well as by the deposition of *a very well-marked coating of copper* on a polished rod of iron.

Sample.—Purchased of Timberlake & Priestley, Wax Chandlers and Pickle-makers, 311. Oxford-street.

Analysis.—1000 grains of the *vinegar* contain 21·62 parts of *acetic acid*, or 2·16 per cent., and ·58 of *sulphuric acid; pickles* contaminated with *rather much copper*, as shown by the ammonia test, as also by the formation of *a coating of the metal* on a polished bar of iron.

Sample.—Purchased of S. Fowler, Oilman, 31. Lisle-street, Newport-market.

Analysis.—1000 grains of the *vinegar* contain 17·07 parts of *acetic acid*, or 1·70 per cent., and 1·55 of *sulphuric acid; pickles* impregnated with *rather much copper*, as shown by the ammonia test, and also by the deposition of *a well-marked crust of copper.*

Sample.—Purchased of Edmonson & Co., Grocers, 29. Tottenham-court-road.

Analysis.—1000 grains of the *vinegar* contain 17·50 parts of *acetic acid*, or 1·75 per cent., and 1·00 of *sulphuric acid; pickles* impregnated with *rather much copper*, as shown by the ammonia test, and also by the deposition of *a well-marked coating of copper.*

Sample.—Purchased of E. Frost, Grocer, 288. Oxford-street.

Analysis.—1000 grains of the *vinegar* contain 18·84 parts of *acetic acid*, or 1·88 per cent., and ·59 of *sulphuric acid; pickles* contaminated with *a small quantity of copper*, the solution of the ash becoming *slightly blue* on the addition of ammonia, and *a very evident deposition of the metal* taking place on the bar of iron.

Sample.—Purchased of Westbrooke & Co., Grocers, 21. Oxford-street.

Analysis.—1000 grains of the *vinegar* contain 23·44 parts of *acetic acid*, or 2·34 per cent., and ·84 of *sulphuric acid; pickles* impregnated with *a considerable quantity of copper*, as shown by the ammonia test, as also by *a well-marked deposition of copper* on the polished rod of iron.

Sample.—Purchased of S. Levy, Oilman, 3. Crown-street, Soho.

Analysis.—1000 grains of the *vinegar* contain 21·98 parts of *acetic acid*, or 2·19 per cent., and ·57 of *sulphuric acid; pickles* impregnated with *a very considerable quantity of copper*, evidenced by the ammonia test, as also by the deposition of a *very well-marked coating of copper.*

Sample.—Purchased of R. Green, Oilman, 32. Little Newport-street.

Analysis.—1000 grains of the *vinegar* contain 26·07 parts of *acetic acid*, or 2·60 per cent., and 1·03 of *sulphuric acid; pickles* contaminated with *rather much copper*, as indicated by the ammonia test, and by the formation of *a well-marked metallic coat.*

9th Sample. — Purchased of W. G. Nixey, Oilman, 22. Moor-street, Soho.

Analysis. — 1000 grains of the *vinegar* contain 14·65 parts of *acetic acid,* 1·46 per cent., and ·38 of *sulphuric acid; pickles* contaminated with *a small quantity of copper*, as shown by *the slight deposition of the metal* the bar of iron.

10th Sample. — Purchased of W. Gilbert, Tallow-chandler, 64. Tottenham-cour road.

Analysis. — 1000 grains of the *vinegar* contain 15·49 parts of *acetic acid,* 1·54 per cent., and *traces of combined sulphuric acid; pickles* contaminat with *rather much copper*, as shown by the ammonia and galvanic tests.

Girkins.

11th Sample. — Purchased of Messrs. Crosse & Blackwell, pickle manufactur 11. King-street, Soho.

Analysis. — 1000 grains of the *vinegar* contain 29·11 parts of *acetic acid,* or per cent., and ·96 of *sulphuric acid; pickles* contaminated with *rather copper*, as shown by the *bluish colour* of the solution of the ash when tre with ammonia, as well as *by the formation of a well-marked met incrustation.*

In reference to the above analysis, we think it right to publish the follow remarks relating to the establishment of Messrs. Crosse & Blackwell, of Soho-square, extracted from the supplement to Ure's "Dictionary of Arts."

"I have examined the apparatus in the great fish-sauce, pickle, and preser fruit establishment of Messrs. Crosse & Blackwell, Soho-square, and find arranged on the principles most conducive to economy, cleanliness, and sa brity; no material employed there is even allowed to come in contact wi *copper.*"

12th Sample. — Purchased of W. Bowley, Oilman, 110. Tottenham-court-ro

Analysis. — 1000 grains of the *vinegar* contain 23·69 parts of *acetic acid,* 2·36 per cent., and ·59 of *sulphuric acid; pickles* contaminated with *rat much copper*, as shown by the tests referred to.

13th Sample. — Purchased of J. Oulds, Oilman, Henry-street, Hampstead-ro

Analysis. — 1000 grains of the *vinegar* contain 15·18 parts of *acetic acid,* 1·51 per cent., and 1·47 of *sulphuric acid; pickles highly impregnated* *copper*, the solution of the ash when treated with ammonia, becoming a *deep blue colour, and a strong metallic crust being instantly deposited* the bar of iron.

The pickles in this case contained so large a quantity of copper, that th might be pronounced absolutely poisonous.

14th Sample. — Purchased of Messrs. Freeman, Pickle-makers, 3. Wigmor street.

Analysis. — 1000 grains of the *vinegar* contain 28·19 parts of *acetic acid,* 2·81 per cent., and 1·29 of *sulphuric acid; pickles* impregnated *with a considerable quantity of copper*, as evinced by the ammonia test, and the formation of *a very well-marked coating of copper* on the iron bar.

Beans.

15th Sample. — Purchased of E. Lazenby & Sons, Pickle-makers, 6. Edwar street, Portman-square.

Analysis. — 1000 grains of the *vinegar* contain 22·94 parts of *acetic acid,* 2·29 per cent., and ·76 of *sulphuric acid; pickles highly impregnated* *copper*, as shown by the *decided blue colour* of the solution of the ash, the addition of ammonia, as well as *by the immediate deposition of a stro crust of the metal*, on immersion in the liquid of a bright bar of iron.

With the exception of samples 13 and 16, these pickles contained mo copper than any of the others.

16th Sample. — Purchased of B. Malden, Oilman, 226 Tottenham-court-road.

Analysis — 1000 grains of the *vinegar* contain 25·32 parts of *acetic acid,* 2·53 per cent., and 70 of *sulphuric acid; pickles highly impregnated* *copper*, the solution of the ash when treated with ammonia becoming *deep blue colour, and a strong metallic crust being instantly deposited* the bar of iron

pickles in this case contained a still larger quantity of copper than was
t in sample 13, and therefore they are to be regarded as still more
ous than the former.

Red Cabbage.

ample.—Purchased of W. King, Oilman, 17. Marylebone-lane.
lysis—1000 grains of the *vinegar* contain 25·00 parts of *acetic acid*, or
50 per cent., and 2·52 of *sulphuric acid*.

ample.—Purchased of E. Vezey, Oilman, 1. James-street, Oxford-street.
lysis—1000 grains of the *vinegar* contain 26·65 parts of *acetic acid*, or
66 per cent., and 2·52 of *sulphuric acid*.

colour of the vinegar in both the samples of pickled red cabbage, was of
t and madder-like red, very much brighter than the bluish-red which we
e in home-made pickled cabbage. We believe that it is common to pro-
is bright colour by means of beet-root, and we suspect that this means
n had recourse to in the present cases. So powerful is the colouring mat-
eet-root, that white cabbage steeped for some time in a strong decoction of
mes very much the appearance of red cabbage; and we have been in-
that what is sold as red pickled cabbage is often nothing more than
abbage thus artificially coloured.

ample.—Purchased of J. Revell, Oilman, 50. James-street, Oxford-street.
lysis—1000 grains of the *vinegar* contain 26·65 parts of *acetic acid*, or
66 per cent., and 1·67 of *sulphuric acid*.

ample.—Purchased of R. Davey, Grocer, 21. Marylebone-lane.
lysis.—1000 grains of the *vinegar* contain 20·83 parts of *acetic acid*, or
08 per cent., and 1·19 of *sulphuric acid*.

y of our readers may have noticed, in their visits to Covent-garden
during the walnut season, the care with which the shells of the walnuts
eserved. These are employed generally to make walnut-ketchup, but
nes are used for pickling, being of course much inferior for the purpose
oung walnuts themselves.

results comprehended in the above analyses are more clearly brought
eview in the annexed table.

SHOWING THE RESULTS OF THE CHEMICAL ANALYSES OF
E ABOVE TWENTY PICKLES OF DIFFERENT DESCRIPTIONS.

	Ignited Carbonate of Soda to neutralise 1000 Grains.	Acetic Acid in 1000 Grains.	Acetic Acid Per Cent.	Sulphate of Baryta in 1000 Grains.	Sulphuric Acid in 1000 Grains.	Copper.
E. H. Wood.	21·84	19·37	1·93	3·98	1·67	A very considerable quantity.
imberlake & Priestly.	23·04	21·62	2·16	1·38	·58	Rather much.
S. Fowler.	19·32	17·06	1·70	3·69	1·55	Rather much.
Edmonson & Co.	19·20	17·50	1·75	2·39	1·00	Rather much.
E. Frost.	20·16	18·84	1·88	1·41	·59	A small quantity.
Westbrooke & Co.	25·20	23·44	2·34	2·01	·84	A considerable quantity.
S. Levy.	23·40	21·98	2·19	1·37	·57	A very considerable quantity.
R. Green.	28·20	26·07	2·60	2·45	1·03	Rather much.
W. G. Nixey.	15·60	14·65	1·46	·91	·38	A very small quantity.
W. Gilbert.	16·08	15·49	1·54	- -	traces.	Rather much.
Crosse & Blackwell.	31·20	29·11	2·91	2·30	·96	Rather much.
W. Bowley.	25·20	23·69	2·36	1·42	·59	Rather much.
J. Ould.	17·28	15·18	1·51	3·44	1·47	In poisonous amount.
Messrs. Freeman.	30·60	28·19	2·81	2·85	1·29	A very considerable quantity.
E. Lazenby & Sons.	24·60	22·94	2·29	1·81	·76	In highly deleterious amount.
B. Malden.	27·00	25·32	2·53	1·68	·70	In poisonous amount.
W. King.	28·56	25·00	2·50	6·00	2·52	No analysis made.
E. Vesey.	28·56	26·65	2·66	6·00	2·52	" "
J. Revell.	29·40	26·65	2·66	3·97	1·67	" "
R. Davey.	22·80	20·83	2·08	2·83	1·19	" "

attentive consideration of the above table, the following general con-
may be deduced:—

That the *vinegar* used for pickling is of *a very weak description*, the per-
tages of *acetic acid* ranging between 1·48 and 2·91. It will be remem-

4th. It will be observed, that *the pickles which contain the lar* *copper, are those which consist entirely of green vegetables.* *beans.*

Notwithstanding the statements made in books, some of which v at the commencement of this Report, when we entered upon thes felt convinced that so poisonous a metal as copper was now rare ployed for the mere purpose of heightening and preserving the c pickles; we are therefore both surprised and grieved at the rea racter of the results to which our investigations have conducted however, now that conclusive evidence of this scandalous pra adduced, and that the public are put upon their guard, a remedy for this great evil.

Pickles, doubtless, when properly prepared, are not very dig now see that much of the ill effects so generally attributed to result from their impregnation with so poisonous a contamination

It is not alone in the pickles that this poison is present, for it m with remarkable readiness and certainty, in the vinegar in which preserved, by the immersion in a small quantity of the vinegar— is sufficient—for a few hours, of a piece of thick iron wire, havin polished surface. This test is of such ready applicability that the public to make use of it, and so ascertain for themselves whet they are using contain the poison or not. If an exceedingly sn copper be present it will be quickly deposited on the surface of th

We have ourselves tried this simple proceeding, first with ha the vinegars in which the pickles, purchased of Messrs. Lazenby an and Malden, were contained; in each case, after the lapse of three a well-marked coating of copper had formed upon the iron rod. it with the two vinegars previously ascertained to contain the sm of copper—that is, those purchased of Messrs. Nixey and Frost; also, after the lapse of a few hours, an incrustation of copper was

Another very simple and efficient method of detecting the pres in pickles, is the following:—Put three or four drops of the sus on the blade of a knife; add one drop of sulphuric acid, and l surface of the knife over the flame of a candle; the vinegar, in ev deposit the copper upon the iron, if any be present.

One of the worst features of this abominable practice is, that th

It is in the vinegar employed for pickle-making especially that we should pect to find acetic and pyroligneous acids; the latter acid is usually detectable the slight odour of creosote, from which it is almost impossible to free it. It of importance that the effect of the action of the sulphuric acid contained in ny of the pickling vinegars on the colour of the pickles should be determined. r own impression is, that it would be found to be injurious.

A visit to a large pickle warehouse, such as that of Messrs. Crosse and Black-ll, during the season of pickle and preserve making, is not without interest. he vast piles of vegetables and fruit ready to be sorted, cut, boiled, &c., is ally astonishing.

It appears, however, that pickle-making is, to a great extent, independent of e seasons, and that most of the different kinds of pickles may be made at any riod of the year. This the makers are enabled to do by keeping a large stock the various sorts of vegetables immersed in brine and packed in barrels. In me of our largest establishments many hundred barrels thus filled may be en. We are informed that the greater part of these vegetables come from road. It is alleged that these vegetables are kept in brine for the sake of onomy, and that they would keep far better in vinegar.

Since this Report was published, it occurred to me it was desirable that certain her kinds of pickles, not included amongst those previously examined, should kewise be subjected to analysis, in order to ascertain whether they also con-ined COPPER, as East India pickles, green chillies, and capers.

East India Pickles. — Purchased of Mr. Hart, Holborn.

These pickles are remarkable for their bright green colour; the ash left on cineration was of *a decided pink colour*, and furnished a solution which, with mmonia, became of a blue colour, indicating the presence of COPPER in *con-derable amount.*

Green Chillies. — Purchased of Wix & Co., Leadenhall-street.

These pickles were of a still deeper green colour, and the ash was *deep pink;* e solution of this, on the addition of ammoniá, became deep blue, from the esence of COPPER *in amount still more considerable.*

Capers.—Purchased of Mr. Clunn, Corner of Liquorpond-street, Grays'-Inn oad.

These capers, when seen through the bottle, appeared bright green, but on moving them from the bottle the greater part of their colour disappeared, and was then ascertained that their greenness was principally due to the bottle in ich they were put up. The ash was quite white, and did not contain copper. This result is different from what was to have been anticipated, seeing that the ferent qualities of capers, dependent chiefly upon size, are obtained by sifting rough copper sieves.

SPICES, AND THEIR ADULTERATIONS.

e come now to the consideration of the important subject of Spices, and eir Adulterations.

When it is remembered that many spices are sold in the state of powder, that ey bear a high price, and that they are all subjected to an excise duty, which some cases is very considerable, it might be supposed that they would be culiarly liable to adulteration.

Notwithstanding these facts, however, little or no attention has hitherto been stowed upon this subject by writers on the sophistication of food, or even on e part of the Excise authorities, whose duty it is to protect the revenue from ud. We have therefore obtained from books but little information to aid us the investigations the results of which we are now about to make known.

Following the plan which we have adopted from the commencement of these ports, before treating of adulteration, we shall give a description, illustrated figures, of the microscopic structure of each kind of spice treated of. A owledge of the minute organisation of the various kinds of vegetable substances liable to adulteration, constitutes the only safe and scientific b for inquiries of this nature.

The spices which we propose to examine, in the following Reports, ar Ginger, Turmeric, Cinnamon, Cassia, Nutmegs, Mace, Cloves, Allspice Pimento, Mixed Spice, Curry Powder and Paste.

GINGER, AND ITS ADULTERATIONS.

The ginger-plant, *Zingiber officinale*, belongs to the very useful natu order, *Zingiberaceæ*, from which turmeric, East India arrow-root, and sc other productions, are obtained.

Ginger grows and is cultivated in the tropical regions of Asia, America, Sierra Leone.

The stem reaches generally three or four feet in height, and is rene yearly; while the root, which is the part known as ginger, botanically ter a rhizome, is biennial.

The roots, or rhizomes, are dug up when about a year old; in Jamaica occurs in January or February, and after the stems are withered. They well washed, freed from dirt, and in some cases, especially with the b kinds, the epidermis or outer coat is stripped off; and hence the divisio ginger into white, scraped or uncoated, and into black, unscraped or coate

In estimating the quality of ginger, a variety of particulars have to be t into consideration — as whether the rhizomes are coated or uncoated, form, colour, and consistence.

The rhizomes of ginger of *good quality* have no epidermis, are plump, whitish or faint straw-colour, soft and mealy in texture, with a short frac exhibiting a reddish, resinous zone round the circumference; the taste sh be hot, biting, but aromatic.

The rhizomes of ginger of *inferior quality* are frequently coated wit epidermis, are less full and plump, often contracted and shrivelled; of d colour, being of a brownish-yellow; of harder texture, termed *flinty*; and fibrous; while the taste is inferior, and less aromatic.

The principal *uncoated* sorts of ginger, according to Dr. Pereira, are —

1. Jamaica ginger, "imported in barrels holding one cwt. each. It i uncoated, pale sort; and when of fine quality, occurs in large, bold, f races, which cut soft, bright, and pale-coloured. Inferior samples are sm the race, darker coloured, more or less flinty and shrivelled."

2. Uncoated Malabar ginger; new sort of Malabar ginger; Tellich ginger; Calicut ginger; Cochin ginger, "a pale uncoated sort, import chests, casks, or bags, sometimes from Tellicherry, but usually from Ca or Cochin." It resembles Jamaica ginger, both in external appearance flavour; but has, externally, more of a brownish or reddish tint. It appeared in English commerce about the year 1841.

3. Uncoated Bengal ginger; scraped Bengal ginger; new sort of Be ginger; Calicut sort of Bengal ginger, "imported in chests of about one a half cwts. It is an uncoated sort, darker than Jamaica ginger; it is no large as the uncoated Malabar sort, and is harder and darker."

The chief *coated* gingers are —

1. Barbadoes ginger, "imported in bags of about sixty or seventy pou It is a coated sort—in short, flat races, which are darker coloured than Jam ginger, and are covered with a corrugated epidermis."

2. Malabar ginger; unscraped Malabar; old sort of Malabar gin common Malabar ginger; Bombay ginger, "imported from Bombay in or packets. It is a coated, dark, and small sort."

3. Bengal ginger; common Bengal ginger; old sort of Bengal gin "imported in bags. It is a coated or unscraped dark sort, which cuts and brownish, but is plumper and less wormy than common Malabar ginge

4. Sierra Leone ginger; African ginger; "imported in casks or bags. a coated sort, the races being generally larger, less flat and less plump, those of the Barbadoes sort, which in other respects they resemble."

According to the authority above referred to, the uncoated gingers — viz. Jamaica, uncoated Malabar, and uncoated Bengal — are assorted for c mercial purposes, according to their qualities, thus: —

1. Bold, soft, and bright ginger.
2. Smaller, but soft and bright.
3. Flinty and dark.
4. Shrivelled, and only fit for grinding.

arbadoes, African, and coated Malabar and Bengal gingers, are usually ssorted.

s the two kinds of ginger above noticed, other descriptions occur. vhat is called *green* ginger, is sometimes imported from Jamaica; it of soft and juicy rhizomes with buds, and appears to have undergone preparation beyond picking and washing.

young shoots put forth every spring by the perennial rhizome are he manufacture of the delicious *preserved ginger* (*conditum zingiberis*). oots are carefully picked, washed, scalded, scraped, peeled, and then d in jars with syrup. (Dr. P. Browne.)

finest preserved ginger is imported from Jamaica, usually in jars. s preserved ginger is seldom brought over. The China preserved stringy. It is sometimes imported in the dried state."

ve been informed that dried ginger of good quality, soft and mealy, the following process, be converted into excellent preserved ginger:— izomes, selected with care, are to be immersed for three or four weeks eak syrup, scarcely stronger than sugar-and-water, to which a small f carbonate of potash has been added; this addition being made to n a fresher and greener tint, and also to assist in softening them. As he ginger has become sufficiently soft, it is put up in very strong syrup sugar.

ned with the microscope, the rhizome of ginger is found to present a ked and characteristic structure.

uter coat or epidermis, consists of several layers of large, angular, transparent cells, of a brownish colour, adhering firmly together, forming a distinct membrane, and when macerated in water, becoming soft and somewhat gelatinous.

Lying upon the under surface of this membrane, and scattered irregularly over it, are generally to be detected oil-globules of various sizes, and of a deep yellow colour, as well as a few cells, identical in structure and tint with those of turmeric.

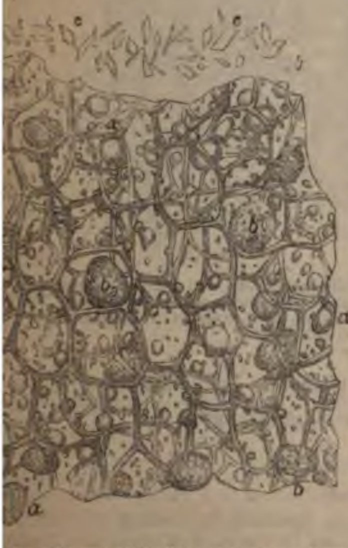
In the substance of the rhizome itself several structures have to be described.

It consists principally of cells having delicate transparent walls minutely punctated, and adhering together so as to form a connected tissue. These cells contain in their cavities starch-corpuscles, which are very abundant, and many of which, as the cell-walls are easily broken, are seen in most sections to have become effused.

Lying here and there in the midst of the above-described cells, are other cells of nearly similar size and form, but of a bright yellow colour; these are in no reinguishable from the coloured cells of turmeric.

the presence of these cells that ginger owes its colour, which varies umber of such cells contained in it.

Fig. 114.



the *epidermis* of the rhizome of ginger, showells of which it is composed, as well as the s, *a a*; also the turmeric-like cells, *b b*; and is very commonly noticed in great numbers ath the epidermis.

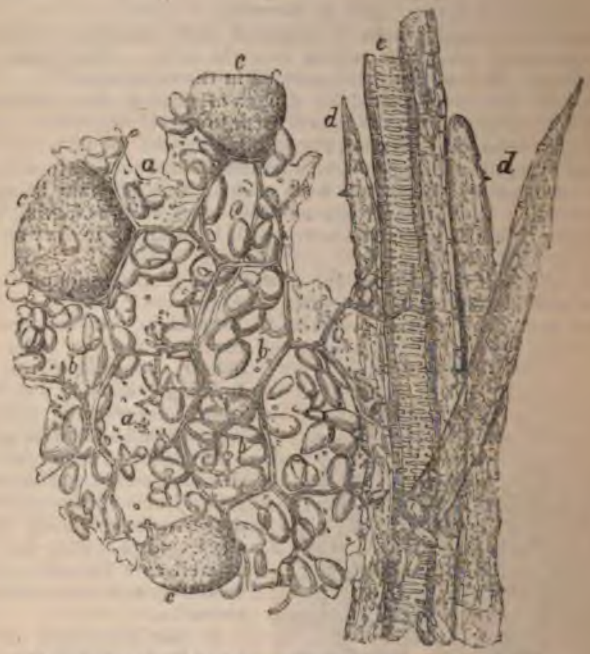
Traversing the rhizome in a longitudinal direction are bundles of woody fib sometimes inclosing, usually one, but occasionally two or even more, dott ducts or vessels.

The starch-corpuscles resemble in some respects those of East India arro root, *Curcuma angustifolia*, but are yet characterised by several distinct featur

Although, like those of *C. angustifolia*, they are usually elongated and f tened, they yet differ from the starch-granules of that plant in being somew smaller, less elongated, and in the greater obscurity of the hilum curved lamellæ.

The structures above described are shown in the following drawing:—

Fig. 115.



This engraving represents the several tissues observed entering into the formation of the ginger rhizome, deprived of its epidermis: *a a*, cells containing the starch-corpuscles; *b b*, starch-granules; *c c*, turmeric-like cells; *d d*, woody fibre; *e*, dotted duct.

The following are the analyses of ginger by Bucholz and Morin:—

Bucholz's Analysis, 1817.

Pale yellow volatile oil - - - -	1·56
Aromatic, acrid, soft resin - - - -	3·60
Extractive, soluble in alcohol - - -	0·65
Acidulous and acid extractive, insoluble in alcohol -	10·50
Gum - - - - - - -	12·05
Starch (analogous to bassorin) - - -	19·75
Apotheme, extracted by potash, (ulmin ?) - -	26·00
Bassorin - - - - - -	8·30
Woody fibre - - - - - -	8·00
Water - - - - - -	11·90
White ginger - - - - -	102·31

Morin's Analysis, 1823.

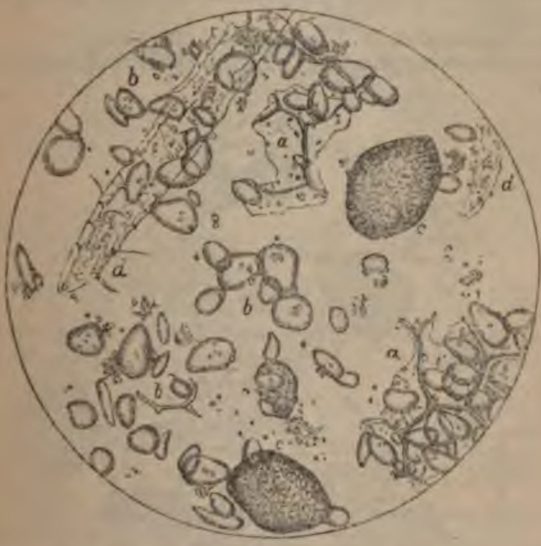
- Volatile oil.
- Acrid, soft resin.
- Resin insoluble in ether and oils.
- Gum.
- Starch.
- Woody fibre.
- Vegeto-animal matter.
- Osmazome.
- Acetic acid, acetate of potash, and sulphur.
- The ashes contained carbonate and sulphate of potash, chloride of potassium, phosphate of lime, alumina, silica, and oxides of iron and manganese.

Ginger.

he *volatile oil* possesses the odour of ginger; the taste, although mild at , is afterwards acrid and hot. The *soft resin* has an aromatic odour, and a ing aromatic taste.

ground ginger the above structures are separated from their proper ection, and occur variously intermixed, and more or less broken and com- ted. See

Fig. 116.



Genuine ground ginger : a a, cells which contain the starch-corpuscles; *b b*, loose starch-granules; *c c*, turmeric-like cells; *d d*, woody-fibre.

ADULTERATION.

at little information is to be obtained from books, relating to the adultera- of powdered ginger.

order to improve the colour of ginger, and, according to some, to protect om the attacks of insects, it is frequently rubbed over with lime; in other s it is washed in chalk and water, when it is called *white-washed ginger*: y, the surface of ginger is occasionally bleached by means of a solution of ride of lime, and sometimes even by exposing it to the fumes of burning hur, and thus made to present a white and floury appearance. By these esses an inferior ginger is often made to assume the appearance of the er descriptions.

Strong and pungent as ginger is, it is still subject to the attacks of insects —acari and larvæ. East India ginger, including the Malabar and Bengal sorts, is more liable to be wormy than either the West India or African kinds.

The only remark with which we are acquainted is the following, which occurs in the second edition of Pereira's "Materia Medica:"—

"Powdered ginger is said to be sometimes admixed with flour, and other amylaceous substances. The microscope would readily detect the adulteration, except in the case of East India arrow-root, the particles of which are similar in appearance to those of ginger."

RESULTS OF THE MICROSCOPIC ANALYSIS OF TWENTY-ONE SAMPLES OF GROUND GINGER, PURCHASED OF VARIOUS LONDON TRADESMEN, GROCERS, AND OILMEN.

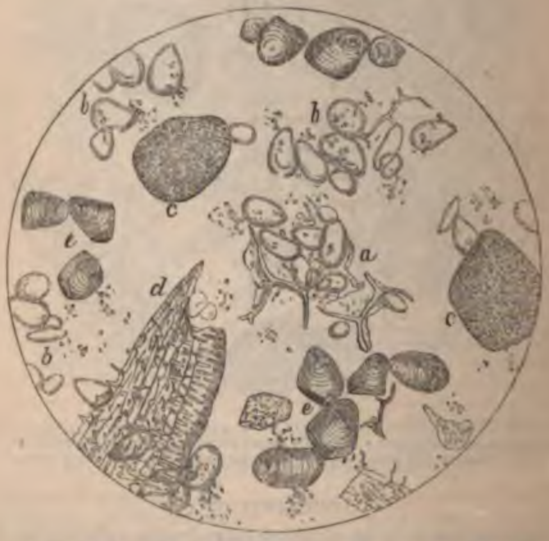
1st Sample.—Purchased of M. Harmer, Battle-bridge.
Adulterated—with *farina*, which consists principally of the starch-granules of the *potato*, the greater number of the grains being much changed by heat.

2nd Sample.—Purchased of F. Ibbetson, 10. Brewer-street, Somers-town.
Adulterated— with *wheat-flour*, and containing a large quantity of *Cayenne pepper.*

3rd Sample.— Purchased of J. Crouch, 57. Chapel-street, Somers-town.
Adulterated—consisting chiefly of *sago-meal*, with some *wheat-flour*, coloured with *turmeric.*

4th Sample.— Purchased of W. Hopkinson, 45. Barbican.
Adulterated—consisting principally of *sago-powder*, with numerous *turmeric*-like cells.

Fig. 117.



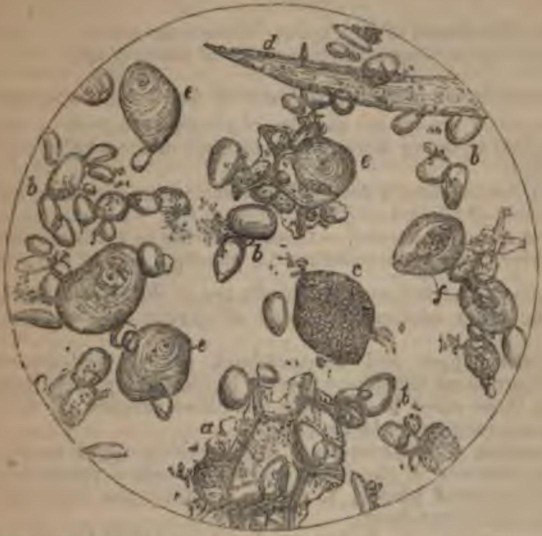
A portion of ground ginger purchased of Mr. Hopkinson, exhibiting the appearance of the article under the microscope, showing it to consist, in part, of powdered ginger, but principally of *sago-meal*. *a a*, cells of ginger; *b b*, starch-granules of ginger; *c c*, large yellow corpuscles analogous to those of turmeric; *d d*, fragment of woody fibre; *e e*, starch corpuscles of *sago-meal*.

5th Sample.—Purchased of Liquorish and Co., 50. Beech-street, Barbican.
Adulterated—consisting in great part of *sago-meal*, the majority of the granules being altered by heat; containing also much *wheat-flour*, and numerous fragments of *mustard-husk.*

Sample. — Purchased of S. Hiram, Mandarin Tea Warehouse, 176. Whitecross-street.

Adulterated — admixed with a very considerable quantity of *farina*, consisting principally of the starch-granules of *sago-meal*, much changed by heat, as well as some of those of the *potato*, and of *wheat-flour*.

Fig. 118.



a a, cells of ginger; *b b*, starch-granules of ginger; *c*, large yellow cell, analogous to those of turmeric; *d*, woody fibre; *e e*, starch-granules of *potato*; *f f*, starch-corpuscles of *sago*, altered by heat.

The above engraving exhibits a portion of the ground ginger purchased S. Hiram. It is seen to consist of ginger, intermixed with two different ms of starch-corpuscles, those of *sago* and the *potato*.

Sample. — Purchased of Stevenson & Co., 159. Whitecross-street.
Genuine.

Sample. — Purchased of W. Earl, 128. Whitecross-street.
Adulterated — with much *wheat-flour*.

Sample. — Purchased of H. Weldon, 111. Whitecross-street.
Adulterated — with much *wheat-flour*, and containing a small quantity of *Cayenne pepper*.

th Sample. — Purchased of G. W. Turner, 215. Whitecross-street.
Adulterated — a very considerable proportion, fully one-half the article, consists of *ground rice*; the pungency of the ginger being mainly attributable to *Cayenne pepper*.

th Sample. — Purchased of W. Clarke, 216. Whitecross-street.
Adulterated — containing a very large quantity of *wheat-flour*.

th Sample. — Purchased of C. Cullingham, 84. Snow-hill.
Genuine.

th Sample. — Purchased of N. Yarrow, 42. King-street, Snow-hill.
Genuine.

th Sample. — Purchased of E. Spiller, 98. Holborn.
Adulterated — consisting chiefly of *sago-powder*.

th Sample. — Purchased of J. Hopkinson, 132. Holborn.
Genuine.

th Sample. — Purchased of W. Edmundson, 29. Tottenham-court-road.
Adulterated — consisting chiefly of *sago-powder*, with a proportion of *turmeric*.

th Sample. — Purchased of W. Cockman, 122. Tottenham-court-road.

Adulterated—consisting chiefly of *sago-powder*, with a proportion of *wheat-flour*, as well as numerous *turmeric-like* cells.

18*th Sample.*—Purchased of G. and E. Back, 123. Tottenham-court-road.
Genuine.

19*th Sample.*—Purchased of Westbrook and Co., 21. Oxford-street.
Adulterated—containing *wheat-flour*.

20*th Sample.*—Purchased of H. Sparrow, 371. Oxford-street.
Genuine.

21*st Sample.*—Purchased of T. Taylor, Whitecross-street.
Adulterated—containing a large quantity of *wheat-flour*.

From an examination of the above Table of Analyses, it appears:—

1st.—That out of *twenty-one* samples of ginger submitted to examination, no less than *fifteen*, being more than two-thirds of the whole, were found to be *adulterated.*

2nd.—That the substances detected were various in character, including *sago-meal*, *potato-flour*, *wheat-flour*, *ground rice*, *Cayenne pepper*, *mustard-husks*, and *turmeric-powder*,—these occurring in various quantities, but in the majority of cases constituting the principal part of the article.

The Cayenne pepper and mustard-husks are no doubt added, with the view of concealing the other adulterations, and of giving apparent strength to the ginger.

Since Cayenne pepper and mustard-husk possess well-marked structural peculiarities there is no difficulty whatever in identifying them under the microscope; but in those cases in which the quantities present are but small, these adulterations are very apt to be overlooked.

The adulteration with wheat-flour is one which might readily escape detection. The observer is therefore cautioned, before proceeding to the examination of powdered ginger, to study carefully the structure of genuine ground ginger and wheat-flour.

On another occasion, we shall insert drawings, exhibiting the characters of ground ginger adulterated with Cayenne pepper and mustard-husks.

The above Report affords most convincing evidence of the extraordinary power of the microscope, in the hands of qualified observers, in bringing to light the secret arts and practices of vile tricksters with our food.

The duty is 5*s.*, British possessions; 10*s.* Foreign. *There is no 5 per cent.* The quantities entered for home consumption were, in 1850, 16,543 cwt.; in 1851, 19,855 cwt.; in 1852, 18,691 cwt. The duty for 1849 amounted to 4449*l.* 11*s.* 7*d.*, in 1850 to 5818*l.* 11*s.* 11*d.*, and in 1851 to 7362*l.* 0*s.* 9*d.* It therefore follows that, on this small article, the revenue suffers a loss, through adulteration, of several hundreds of pounds yearly.

TURMERIC, AND ITS ADULTERATIONS.

TURMERIC-POWDER consists of the ground tubers of *Curcuma longa*, a plant which is extensively cultivated in the neighbourhood of Calcutta, in Bengal, as also in China and Cochin China.

The bulbs are small and furnished with numerous long palmate tubers, internally of a deep orange-colour. There are two descriptions of tubers—the one round, the other long; but both are yielded by the same plant.

"The first are round, oval, or ovate, about two inches long, and one inch in diameter, pointed at one end, and marked externally with numerous annular wrinkles. The second are cylindrical, not exceeding in thickness the little finger; two or three inches long, somewhat contorted, tuberculated. Both kinds are yellowish externally, internally more or less orange-yellow, passing into reddish-brown. The fractured surface has a waxy appearance. The odour is aromatic, somewhat analogous to ginger, but peculiar; the taste is aromatic. When chewed, it tinges the saliva yellow. Its powder is orange-yellow. The tubers are frequently worm-eaten."*

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* Pereira's Materia Medica, 3rd Edition, p. 1122, Part 1.

The following varieties of turmeric are known in the English markets, and are thus described by Dr. Pereira:—

"1. *China Turmeric.*—This sort consists of smooth, plump, round, and long tubers, of a greenish hue externally. They yield a bright powder, and on that account are much preferred for medical purposes. Hence they fetch a higher price than any other sorts of turmeric. Probably if much of it were brought to market it would not fetch more than the Bengal sort.

"2. *Bengal Turmeric.*—This sort consists of thin or narrow long tubers, which are moderately smooth externally, and of a greyish dull yellow colour. They break with a deep reddish fracture. Although, from the dull appearance of its narrow tubers, it is not a very inviting sort to the inexperienced eye, yet it fetches a higher price than the Madras sort, on account of its being a much stronger dye.

"3. *Madras Turmeric.*—This is the most showy of all the kinds of turmeric. It consists principally of large long tubers, but mixed with transverse sections of round tubers. Externally the tubers are marked by longitudinal wrinkles, the surface of which is rubbed and bright yellow; internally the colour is that of a fresh-fractured surface of gamboge.

"4. *Malabar Turmeric, Bombay Turmeric.*—This sort is not constantly found in the market. It consists principally of long tubers, the round tubers being few, and of a very inferior quality. This sort of turmeric is smaller and more shrivelled than the Madras sort, but otherwise somewhat resembles it.

"5. *Java Turmeric.*—Not frequently found in the English market. In a general way it may be said to resemble the China sort. It consists of both round and long tubers, but chiefly the latter. They have a greenish-yellow hue.

"Under the name of *bulbs of Batavian Turmeric*, I have received a sample of round tubers, said to be from Java. Dr. T. Martius notices this sort as having been brought, for many years, from Batavia, and adds that it contains much colouring matter, and is probably the produce of *curcuma viridiflora*."

Examined with the microscope, the tubers are found to display a characteristic and beautiful organization.

The epidermis consists of a single layer of transparent cells, which, in the dried tuber, exhibit a shrunken appearance; these being firmly adherent to each other, form a continuous membrane.

The tuber itself is made up of several distinct structures. Thus, first, we notice a connected tissue, formed of angular, transparent, and *colourless cells*, having thin membranous walls.

Secondly, these cells contain, in their interior, large *masses of a yellow colour*, which take the form of, and in most cases accurately fill, the cavities of the cells. It is in these masses that the colouring matter of turmeric is principally located.

When broken up and carefully examined, the masses are found to consist not only of colouring matter, but of numerous starch-corpuscles, which approximate, in their form and appearance, to those of the allied plant *curcuma angustifolia*, but are much less numerous, less developed, and separable from the other constituents of the masses only with difficulty.

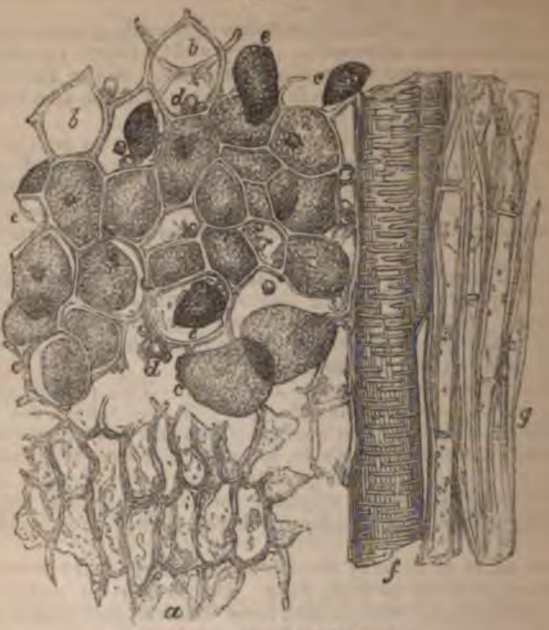
In thin sections of the tuber, the above-described characters, as well as others to be presently noticed, are well seen. In some cases the transparent cells, filled with their coloured contents, are visible, in others the coloured masses have escaped from the cells in which they were contained, and both may be seen lying side by side.

Lastly, scattered amongst the cells, are to be observed a few *coloured oil-globules*, as well as numerous *deep reddish-brown masses* of irregular size and form, which are evidently of a resinous nature, and upon the presence of which the resinous fracture of the tubers depends.

Lastly, dotted ducts, which approach in character to spiral vessels surrounded by woody fibre, which exhibits a jointed and cellular structure, complete the organization of the tuber.

The whole of the above particulars are well displayed in the annexed illustration.

Fig. 119.



SECTION OF TUBER OF TURMERIC.

a a, Epidermis; *b b*, transparent cells; *c c*, yellow masses; *d d*, oil-globules; *e e*, resinous masses; *f*, dotted duct; *g*, elongated cells of woody fibre, lying by the side of the duct.

The composition of turmeric is shown in the following analysis:—

John's Analysis.

Yellow volatile oil - - - - -	1
Curcumin - - - - - -	10 to 11
Yellow extractive - - - - -	11 to 12
Gum - - - - - -	14
Woody fibre - - - - - -	57
Water and loss - - - - -	7 to 5
	100

Vogel and Pelletier's Analysis.

Acrid volatile oil.	Starch.
Curcumin.	Woody fibre.
Brown colouring matter.	Chloride of calcium.
Gum (a little).	Turmeric.

The word *curcumin* is applied to the resinous colouring matter of turm which is soluble only in ether.

RESULTS OF THE MICROSCOPICAL ANALYSIS OF TEN SAMPLES OF TURM POWDER, PURCHASED OF DIFFERENT LONDON TRADESMEN.

1*st Sample.*—Purchased of T. F. Probin, Oilman, 17. Cross-street, Walw road.
Genuine.

2*nd Sample.*—Purchased of C. Roads, Oilman, 11. Black Prince-row, worth.
Genuine.

.—Purchased of S. Jackson, Oil and Italian Warehouseman, 75.
ian-street, Borough.

.—Purchased of G. Pike, Oilman, 77. High-street, Borough.

.—Purchased of H. North, Oilman, 135. High-street, Borough.

.—Purchased of J. Woolmer, Italian Warehouseman, 80. Goswell-

.—Purchased of Glucken and King, Oilmen, 17. Mount-row,
on.

.—Purchased of C. Young, Oilman, 8. High-street, Islington.

.—Purchased of W. I. Brown, Oilman, 12. High-street, Islington.

'e.—Purchased of H. Davis and Co., Oil and Italian Warehouseman,
gh-street, Islington.

ppears that we have at length the rare satisfaction of meeting with
not subject to adulteration. Inasmuch as turmeric enters largely
omposition of curry powder and some other condiments, it was
o ascertain whether it was liable or not to sophistication.
pness of turmeric-powder, and the comparatively small quantity of
plain the reason of its having hitherto escaped the hands of the
.

c is free of duty. Wholesale price, 9*s.* to 14*s.* per cwt.

CINNAMON, AND ITS ADULTERATIONS.

x is the bark of the *Cinnamomum Zeylanicum*, one of the Lauraceæ,
family, to which also belong Cassia and Camphor, as well as some
s possessing medicinal properties, especially Clove-bark.
n is cultivated principally in Ceylon.
nnamon-bark of Ceylon is obtained by the cultivation of the plant.
al *cinnamon gardens* lie in the neigbourhood of Columbo. The bark
choliahs, having selected a tree of the best quality, lop off such
s are three years old, and which appear proper for the purpose.
ranches, much less than half an inch, or more than two or three
iameter, are not peeled. The peeling is effected by making two
r, when the branch is thick, three or four longitudinal incisions, and
ing the bark by introducing the peeling-knife between it. When the
es firmly, the separation is promoted by friction with the handle of
In twenty-four hours the epidermis and greenish pulpy matter (rete
are carefully scraped off. In a few hours the smaller quills are in-
to the larger ones, and in this way a congeries of quills formed,
uring forty inches long. The bark is then dried in the sun, and
made into bundles with pieces of bamboo-twigs.
non is imported in bales, boxes, and chests, principally from Ceylon;
t also from Madras, Tellicherry, and rarely from Java and other

er to preserve and improve the quality of the bark, black pepper is
mongst the bales of cinnamon in stowing them at Ceylon (Percival).
states that ships are sometimes detained for several weeks, through
pepper to fill the interstices between the bales in the holds.
cinnamon arrives in London, it is unpacked and examined; all the
d broken pieces are removed from it. It is then re-made into bales.
ylindrical, three feet six inches long, but of variable diameter, per-
n inches on the average. These bales are enveloped by a coarse

cloth called *gunny*. The cinnamon in boxes and chests is usually the small, inferior, and mouldy pieces.

"Four kinds of cinnamon are distinguished in the London markets; namely, *Ceylon*, *Tellicherry*, *Malabar*, and *Java* cinnamon. The latter, however, is rarely met with. A fifth kind, called *Cayenne*, occurs in French commerce.

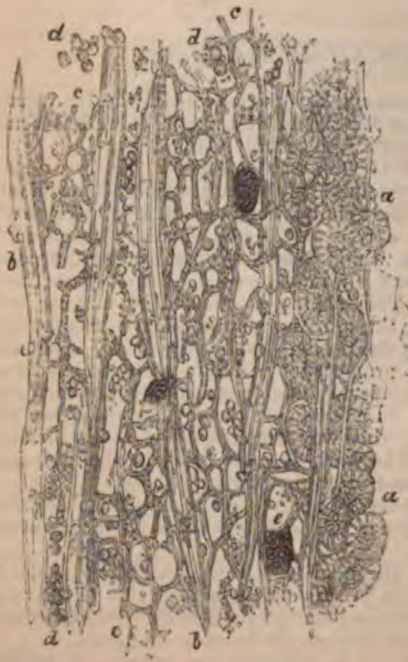
"1. *Ceylon cinnamon.*—This is the most esteemed kind. The fasciculi or compound quills, of which the bales are made up, are about three feet six inches long, slender and shivery, and are composed of several smaller quills, inclosed one within the other. The bark is thin (the finest being scarcely thicker than drawing-paper), smooth, of a light yellow-brown, or brownish-yellow colour, moderately pliable, with a splintery fracture, especially in the longitudinal direction. The inner side, or *liber*, is darker and browner, and contains, according to Rees, small medullary rays filled with a red juice, and which he regards as the peculiar bearers of the aroma. The odour of the bark is highly fragrant. The flavour is warm, sweetish, and agreeable. Inspection and tasting are the methods resorted to for ascertaining the qualities of cinnamon.

"Ceylon cinnamon is characterized by being cut obliquely at the bottom of the quill, whereas the other kinds are cut transversely. In the London market, three qualities of Ceylon cinnamon are distinguished; viz., *first*, *seconds*, and *thirds*, Inferior kinds are thicker, darker, browner, and have a pungent, succeded by a bitter, taste.

"2. *Tellicherry or Bombay Cinnamon*, is grown on one estate only, at Tellicherry, by Mr. Brown, and is wholly consigned to Messrs. Forbes & Co.: only 120 or 130 bales are annually imported. In appearance, it is equal to the Ceylon kind; but the internal surface of the bark is more fibrous, and the flavour is inferior. It is superior to the Malabar variety.

"3. *Madras or Malabar Cinnamon*, is of inferior quality. It is grown, I am informed, on the Coromandel coast. It is coarser and inferior in flavour to the other kinds. In thickness, it approximates to cassia lignea. Its quality has annually deteriorated since its introduction into the market. It does not meet with a ready sale, and it is expected that its importation will cease.

Fig. 120.



Longitudinal section of *cinnamon* carried transversely through the bark, magnified 140 diameters.
a a, stellate cells; *b b*, woody fibre; *c c*, starch-cells; *d d*, starch-granules; *e e*, granular cinnamon-coloured cells or bodies.

"4. *Java Cinnamon.*—This is said to be equal in quality to the Ceylon sort.

"*5. Cayenne Cinnamon.*—This is unknown in the London market. Its volatile oil is more acrid and peppery than the oil from Ceylon cinnamon."

Cinnamon, under the microscope, presents a complicated and very distinct organization, which is best seen in longitudinal sections carried through the thickness of the bark.

On the outer or external surface of the section are observed numerous stellate cells, separable readily from each other, and similar to those which we have so often before described as occuring in other vegetable structures. These cells lie one upon the other in several layers, and form a considerable part of the thickness of the bark. They are situated in the intervals between the woody fibres; they are of a quadrangular or oval form, having the long axes placed usually transversely to the bark;

h being greater than their depth. In whatever position they are
h the central cavities and the rays which proceed from them are
asionally, though not usually, a few starch-granules may be seen in
of these cells. Proceeding from without inwards, these cells are
y others, which are distinguished from the first by the absence of
thinness of their walls, and by the firmness with which they ad-
other; they generally contain a few starch-corpuscles. These
form several series, complete the thickness of the bark.

ed between both the first and second kinds of cells are numerous
s, which are rather short, pointed at either extremity, and furnished
al canal. It is these which impart the fibrous character to cinna-
larly observable in fractures of the bark.

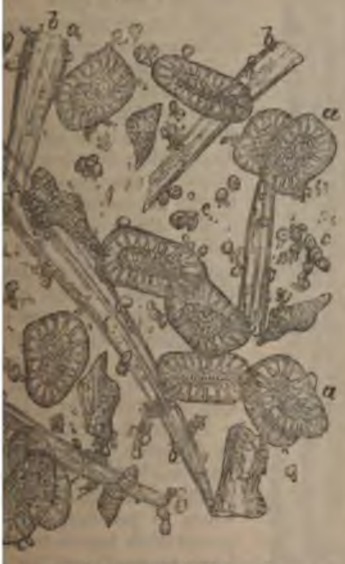
h-corpuscles of cinnamon are small, more or less globular, and fur-
a very distinct hilum, which has the appearance of a central de-
hey usually occur singly, but sometimes united in twos or fours.
ity of starch in cinnamon is so small, that the decoction of the bark
ome blue on the addition of iodine.

ing in the cavities of the most external of the second order of cells,
tly to be observed deep cinnamon-coloured masses of granular

structural particulars are all shown in *fig.* 120.

cinnamon the several structures are disunited and broken. The
occur singly, or in groups of two, three, or more; the woody fibre is disengaged, and is scattered about, resembling somewhat, in form and appearance, the hairs which occur on many plants; the starch-corpuscles are set free from their cells; and lastly, the cinnamon-like masses may be seen in the field of the microscope, dispersed here and there. (*Fig.* 121.)

Fig. 121.



MON *powder*, magnified 220 diameters. *a a*,
; *b b*, woody fibre; *c c*, starch-granules.

ADULTERATION OF CINNAMON.

But little precise information has been obtained hitherto in reference to the adulteration of cinnamon. It is known that the bark, after the abstraction of the greater part of its active principles, as by the distillation of cinnamon-water and oil of cinnamon, is re-dried and offered in the market as ordinary cinnamon. But no certain means have, up to the present time, been pointed out for the detection of this fraud, although it may be discovered in a very ready and simple manner.

h-corpuscles of all vegetables, when subjected to the action of
, enlarge considerably in size, and undergo a great change in form.
then, to ascertain whether the cinnamon has been tampered with in
above described, nothing more is necessary than to powder a
he cinnamon in a mortar, and to examine carefully with the
the condition of the starch-granules. If these are larger than
lost their proper form, and appear distorted and irregular, the
as unquestionably been subjected to the action of boiling water,
ould have been for the purpose of extracting its essential oil. If
n has been subjected to the prolonged action of the water, the

starch-granules will have become so broken up and dissolved that they longer be detected.

We have ourselves made trial of the above method, with the barks cinnamon and cassia, with complete success.

A very common practice, as we shall see hereafter, is to substitute cas cinnamon, either in the bark or in powder.

Not to anticipate, however, the results of the analyses to be given her we omit for the present to refer to several other adulterations of cin which we have detected in the course of our investigations.

Since cassia is so frequently substituted for cinnamon, it becomes nec before we shall be able to undertake the examination of the latter, that we acquaint ourselves intimately with the nature and structure of cassia bar to the consideration of which we will next proceed.

CASSIA, AND ITS ADULTERATIONS.

Since cassia — *Cinnamomum Cassia* — belongs to the same genus of pl the true cinnamon, it is not very surprising that they should resemble each closely as they do. Notwith ing their striking resemb there are characters, howev which they may be discrimin

The bark of cinnamon is thicker than drawing-pape breaks with an uneven and margin: while each stick con eight, ten, or more pieces or bark inserted one within the

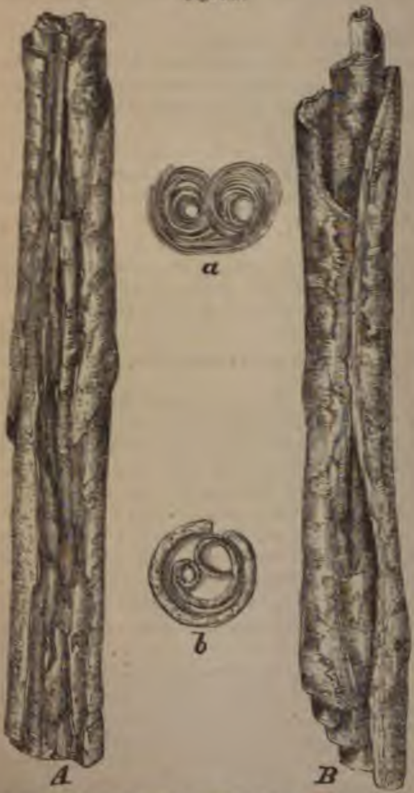
Cassia bark is much stouter often as thick as a shilling; it short, and without splinterin these characters alone it is distinguish cinnamon from when in the whole state, as by the accompanying drawin

But these barks differ colour and taste. Cinnamon and browner than cassia, w usually redder and brighter. taste of the one is sweet, mil aromatic, leaving no unpleas pression on the tongue, whi of the other is less sweet, str and is followed by a bitternes

These characters, however in different samples, so tha impossible by these means al distinguish cinnamon from when in powder, and we a aware that any certain mean been pointed out for effecti discrimination, especially wh two are mixed in different p tions; but here again, as in so other cases, the microscope us invaluable assistance.

Sections of cassia bark, under the microscope, bear general resemblance to th cinnamon, but differ in their width and the relative prop of the several structures, p ly in the size and number of the starch-corpuscles.

Fig. 122.



A, Stick of CINNAMON of the natural size and appearance, showing the thinness of the bark, and the manner in which the layers are enclosed one within the other; *a*, cross section of same, exhibiting more completely the number of the layers, and their disposition.

, Stick of CASSIA of the natural size and appearance, showing the thickness of the bark, and the manner in which the layers are enclosed within each other; *b*, cross section of same, exhibiting the disposition of the layers.

rve on the outer surface, as in cinnamon, the peculiar stellate cells, of which, however, much more commonly than those of cinnamon, ith well-developed starch-corpuscles.

ext to these, we notice what may be termed the proper starch-cells, mmed quite full of starch-corpuscles, which, while they have the same m as those of cinnamon, are yet two or three times larger, as well as more numerous.

dy fibre occurs, as in cinnamon, interspersed between both descrip-ls, and it does not appear to differ appreciably from that of cinnamon. tire thickness, about one-fourth is formed by the stellate cells; the three-fourths being made up of the starch-bearing cells.

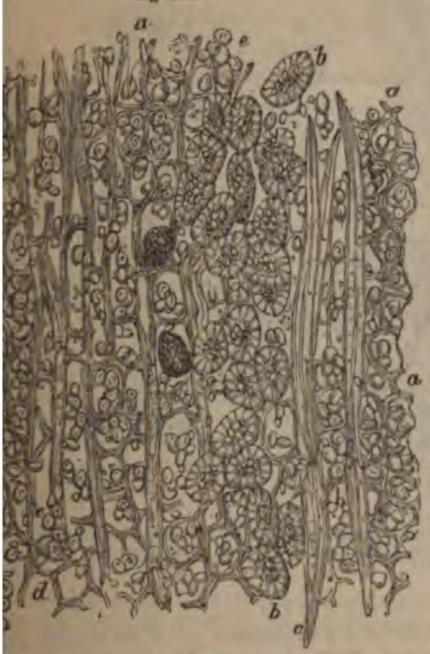
ered cassia, therefore, as contrasted with powdered cinnamon, the stellate cells and woody fibre are much less abundant, while the starch-granules are at the same time much larger, and far more numerous.

Powdered cassia may then at all times be discriminated from powdered cinnamon by the size and abundance of the granules of starch, the amount of which is so considerable, that iodine turns the decoction of a blue colour.

The several kinds of cassia are thus described in Pereira's "Materia Medica:"—

"1. *China cassia-lignea* (sometimes called *China* cinnamon) is the best kind. It is usually imported from Singapore, rarely from Canton direct. Mr. Reeves says vast quantities of both cassia buds and cassia-lignea are annually brought to Canton from the province of Kwang-se, whose principal city (*Kwei Lin Too*), lite-ty of the forest (or grove) of cassia trees, derives its name from the Cassia around it.

Fig. 123.



ection of CASSIA, carried transversely through the bark, diameters.
dermis; *b b*, stellate-cells; *d d*, starch-cells; *e e*, starch-granular, cinnamon-coloured masses.

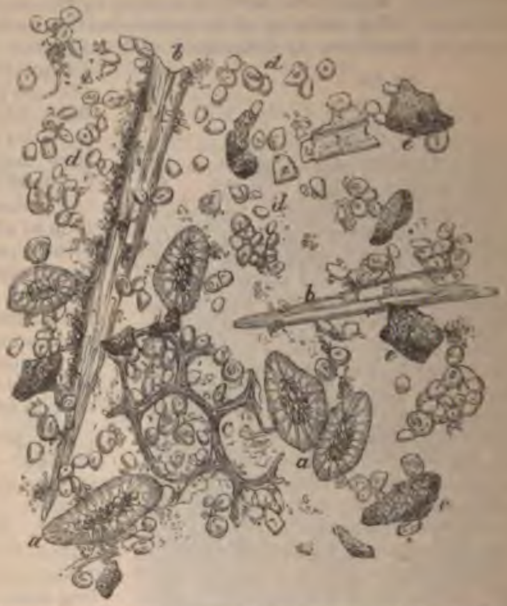
hinese themselves use a much thicker bark (which they call *Gan* unfit for the European market. Mr. Reeves informs me that they o highly as to pay nearly ten dollars per pound for it. A very fine occasionally met with, and commands the enormous price of 100 catty (one pound and three quarters). A specimen of it, with which dly furnished me, is straight, semi-cylindrical, eleven inches long, e than an inch wide, and about one-sixth or one-eighth of an inch ternally it is warted, and covered with crustaceous lichens. Inis deep brown; its odour and flavour are those of cassia. Mr. Reeves s me that the best cassia-lignea is cut in the third or fourth moon, sort in the sixth or seventh moon.

abar cassia-lignea.—This is brought from Bombay; it is thicker and n that of China, and is more subject to foul-packing; hence each bundle requires separate inspection. It may, perhaps, be coarse cinnamon Dr. White states that the bark of the older branches of the genuine cinn plant is exported from the Malabar coast as cassia.

"3. *Manilla cassia-lignea.* — This, I am informed, is usually sold in bon continental consumption. I have received a sample of bark ticketed 'C vera, from Manilla,' the epidermis from which was imperfectly removed.

"4. *Mauritius cassia-lignea.* — This is occasionally met with."

Fig. 124.



Genuine CASSIA *powder*, magnified 220 diameters; *a a*, stellate cells; *b b*, woody fibre; *c c*, starch-cells; *d d*, starch-granules; *e e*, granular masses.

RESULTS OF THE MICROSCOPIC EXAMINATION OF THIRTY-ONE SAMP CINNAMON PURCHASED OF VARIOUS LONDON TRADESMEN, ITALIAN HOUSEMEN, GROCERS, AND OILMEN.

WHOLE CINNAMON.

1*st Sample.* — Purchased of Alexander Braden, Grocer, 13. High-street, Is 8*d*. per oz.
Genuine.

2*nd Sample.* — Purchased of Gluckner & King, Oilmen, 17. Mount-row, Is 6*d*. per oz.
Genuine.

3*rd Sample.* — Purchased of Pye & Co., Tea-dealers, 37. Little Pulteney Soho. 8*d*. per oz.
All *cassia*.

4*th Sample.* — Purchased of J. Waltham, Oilman, Edward-street, Sol per oz.
Consisting entirely of *cassia*.

5*th Sample.* — Purchased of S. Austin, Grocer, 3. Old Compton-street 8*d*. per oz.
Consisting entirely of *cassia*.

Sample. — Purchased of Cooper & Co., Moor-street, Soho. 6*d.* per oz.
Nothing but *cassia.*
Sample. — Purchased of E. Holloway, Oilman, 56. Poland-street. 1*s.* per oz.
Nothing but *cassia.*
Sample. — Purchased of Mr. Harris, Oilman, —. Poland-street. 1*s.* per oz.
Genuine.
Sample.— Purchased of Waller & Co., Grocers, 5. Berwick-street. 1*s.* per oz.
Genuine.
h Sample. — Purchased of J. Way & Co., Grocers, 272. Oxford-street. 1*s.* per oz.
Genuine.
h Sample.— Purchased of W. Owtram, Oilman, 7. Wardour-street. 8*d.* per oz.
Genuine.
h Sample. — Purchased of Jones & Co., Grocers, 166. Oxford-street. 8*d.* per oz.
Genuine.

Powdered Cinnamon.

Sample. — Purchased of Brocksopp, Sons, & Co., Grocers, 234. Borough. 6*d.* per oz.
Nothing but *cassia.*
Sample. — Purchased of J. Rose & Co., Grocers, 213. Borough. 8*d.* per oz.
Genuine.
Sample. — Purchased of Harrington & Lucas, Grocers, 113. High-street, Borough. 8*d.* per oz.
Genuine.
Sample. — Purchased of Russell & Co., Grocers, 72. Borough. 6*d.* per oz.
Adulterated — containing an enormous quantity of baked *wheat-flour*, together with some *sago-powder.*
Sample. — Purchased of Newsom & Williams, Grocers, 50. High-street, Borough. 6*d.* per oz.
Adulterated — consisting of *cassia*, and containing a portion of *sago-powder.*
Sample. — Purchased of R. Jones, Grocer, 16. Borough. 6*d.* per oz.
Adulterated — powder becoming thick and viscid when wetted, from the presence of an enormous quantity of baked *sago-powder.*
Sample. — Purchased of Mitchell & Co., 17. Blackman-street, Borough 6*d.* per oz.
Genuine.
h Sample. — Purchased of Dannan & Co., Grocers, 2. Walworth-road. 8*d.* per oz.
Adulterated — containing a small quantity of *potato-flour.*
t Sample. — Purchased of W. P. Moore, Grocer, 4. Crown-row, Walworth. 8*d.* per oz.
Adulterated — containing an enormous quantity of *East India arrow-root.*
d Sample. — Purchased of W. M. Nicholson, Grocer, 86. Upper-street, Islington. 10*d.* per oz.
Consisting entirely of *mixed spice*, sold probably by mistake.
rd Sample. — Purchased of R. Rowton, Grocer, 46. Chapel-street, Islington. 8*d.* per oz.
Adulterated — admixed to a very large extent with *sago-powder* and baked *wheat-flour.*
th Sample. — Purchased of J. Barber, Grocer, 14. Rufford's-buildings, Islington. 8*d.* per oz.
Genuine.
th Sample. — Purchased of Roberts & Arnold, Grocers, 1. Rosamon-buildings, Islington. 4*d.* per oz.
Adulterated — made up of *cassia* and baked *wheat-flour.*
th Sample. — Purchased of W. Young & Son, Grocers, 27. High-street, Islington. 8*d.* per oz.
Adulterated — consisting of *cassia* and much baked *wheat-flour.*
th Sample. — Purchased of Alex. Braden, Grocer, 13. High-street, Islington. 8*d.* per oz.
Consisting entirely of *cassia.*

28th Sample. — Purchased of C. Young, Italian Warehouseman, 8. High-street, Islington. 1*s.* per oz.
Genuine.

29th Sample. — Purchased of Beckett & Young, Grocers, 3. High-street, Islington. 8*d.* per oz.
Consisting entirely of *cassia.*

30th Sample. — Purchased of G. Budd, Grocer, 86. Goswell-road. 8*d.* per oz.
Adulterated — powder when wetted becoming thick and viscid, from the presence of a large quantity of baked *wheat-flour.*

31st Sample. — Purchased of J. Woolmer, Grocer, 80. Goswell-road. 8*d.* per oz.
Adulterated — containing a large quantity of baked *wheat-flour* and some *sago-meal.*

32nd Sample. — Purchased of C. Legg, Grocer, 18. Wardour-street. 6*d.* per oz.
Genuine.

From an examination of the above Table of Analyses it appears —

1st. That of the *whole* cinnamons, *seven* were *genuine*, and that *five* consisted of nothing but *cassia.*

2nd. That while the prices per ounce for the *whole* cassias varied between sixpence and one shilling, one being charged sixpence; three, eightpence; and one, a shilling; those for the cinnamon also varied between sixpence and one shilling; one being charged sixpence; three, eightpence; and three, one shilling.

3rd. That out of the *nineteen* samples of *ground* cinnamon, *three* consisted entirely of *cassia.*

4th. That *ten* of the samples, more than one-half, were *adulterated*, the articles most frequently employed being either *baked wheat-flour* or *sago-meal*, separately or in combination; but *East India arrow-root* and *potato-flour* were likewise detected, each in one instance.

5th. That of the above adulterated samples, *three* consisted of *cassia*, adulterated; and *seven* of *cinnamon*, adulterated.

6th. That *six* only of the *nineteen* samples were *genuine.*

7th. That the prices given per ounce for the powdered *cassia*, substituted for cinnamon, were sixpence and eightpence, one being sixpence, and two eightpence.

8th. That the prices paid for the genuine powdered cinnamon were sixpence, eightpence, and one shilling per ounce, two being sixpence, three eightpence, and one a shilling.

9th. That the prices charged for the adulterated articles, whether cassia or cinnamon, were fourpence, sixpence, and eightpence per ounce — viz., one at fourpence, three at sixpence, and six at eightpence per ounce.

It thus appears that in the prices charged for cassia and cinnamon, whether whole or in powder, and whether genuine or adulterated, no constant difference is to be observed, and consequently that the public suffer great loss by the substitution of cassia, which is so much cheaper, for cinnamon, and a still greater loss by the other sophistications. Further, it appears that, contrasting the prices of genuine whole with those of genuine ground cinnamon, for some reason unknown to us, the latter are sold at a cheaper rate than the former.

It will be observed that the wheat-flour and sago-powder used for the adulteration of ground cinnamon are stated in the analyses to have been baked; the purpose of this is obvious — namely, that they may assimilate in colour to either cinnamon or cassia, and thus the better escape detection.

From M'Culloch's "Commercial Dictionary," under the head of "*Cinnamon Monopoly*," we meet with the following observations: —

"Down to 1833, the cultivation of cinnamon in Ceylon was restricted to a few gardens in the neighbourhood of Colombo, the production and sale of the article being wholly monopolised by government. Upon the transference of the island from the East India Company to the king's government, the former agreed to pay 60,000*l.* a year for 400,000 pounds, or 4342½ bales of cinnamon: it being stipulated that if the quantity collected exceeded this amount *the surplus was to be burned!*

"But this agreement was afterwards broken off, and the cinnamon was sent ngland by government and sold, on its account, at quarterly sales. The revenue derived from the cinnamon monopoly in 1831 is said to have inted to 127,961*l.* As the monopoly could not be enforced, except by ning the culture of cinnamon to certain districts, it necessarily led to the oppressive interferences with the rights of individuals, to the creation of erless imaginary offences, and the multiplication of punishments, forming avy drawback on the prosperity of the island. A sense of these disad-ges led at length to the abolition of the monopoly system in 1833, when we d to be amenable to the charge of upholding, without improving, the worst of the Dutch policy, and restored to the natives their right to cultivate mon anywhere, and in any way they think fit."

the abolition of the monopoly system, the exorbitant duty of 3*s.* per pound mposed on all cinnamon exported, without distinction of quality. The result is policy was, that the exports declined considerably below what they were g the period of the monopoly; and, notwithstanding a further reduction of in 1841 to 2*s.* per pound, the exports in that year amounted to only 323,461 ds, producing a revenue of 33,111*l.*; this result being attributable partly e high duty, partly to the culture of cinnamon in other places, but princi- by the duty encouraging the use of cassia and other substitutes in place of enuine article. Since 1841, however, the export duty has been still further ced. During the three years ending 1842, the *cinnamon* entered for con-ption, and the duties, were: —

Quantities.

1840.	1841.	1842.
16,432 lbs.	15,625 lbs.	17,009 lbs.

Duties.

1840.	1841.	1842.
410*l.* 12*s.* 10*d.*	415*l.* 10*s.* 10*d.*	327*l.* 2*s.* 11*d.*

e duty on cassia in 1825 was reduced from 2*s.* 6*d.* to 1*s.*, and in 1829 to 6*d.* ound. Owing partly to these reductions, and partly to the heavy duty on mon, the consumption of cassia, says Mr. M'Culloch, has more than trebled 1820.

e quantities of *cassia* returned for home consumption in the United King- and the amount of duty received thereon in the three years 1840, 1841, and were as follows: —

Quantities.

1840.	1841.	1842.
74,050 lbs.	83,034 lbs.	119,470 lbs.

Duties.

1840.	1841.	1842.
1933*l.*	2219*l.*	1692*l.*

e import duty on cassia was, in 1851, 9*s.* 4*d.* per cwt., and five per cent., and nnamon, 6*d.* per pound, and five per cent.

king into consideration the great difference in the import and export duties e two articles, and the consequent high price of cinnamon, we perceive strong the inducement is for substituting cassia for cinnamon, and also for erating it with wheat flour, sago-meal, &c., in those cases in which cassia is mployed.

e import duty on cinnamon, it will be observed, is the same as that on r, notwithstanding which fact, and the frequency with which cinnamon lterated, we do not remember that we have ever heard of a prosecution for ommon infraction of the excise laws.

e duties in force *at the present time* on cinnamon and cassia are as follow. e *export* duty on cinnamon in Ceylon was reduced to 1*s.* per lb., in 1843; per lb. in 1848, and is since abolished altogether. The *import* customs' is 2*d.* per lb. Wholesale price, 11*d.* to 1*s.* 10*d.* per lb. Were entered for consumption in 1852, 36,325 lbs.; in 1853, 37,694 lbs. As the consump-f spices is always greater by far in the second half of the year, it is tive to give the first six months of the year. We have therefore omitted

Cassia buds and cassia fistula are free of duty. On cassia lignea (or bark) the duty is 1*d*. per lb. Wholesale price about 1*s*. per lb. ex. duty. There were entered for home consumption in 1852, 109,029 lbs.; in 1853, 136,363 lbs.

We have now to treat of the adulteration of Nutmegs, Mace, Cloves, Pimento or Allspice, and Mixed Spice, and to ascertain to what extent the quality and value of these articles are affected by admixture with inferior and foreign ingredients.

We shall treat first of Nutmegs.

NUTMEGS, AND THEIR ADULTERATIONS.

There are three species of *Myristica*, which furnish nutmegs. That which yields the best description, *Myristica fragrans*, forms a tree from twenty to twenty-five feet high, somewhat similar in appearance to a pear-tree.

The fruit is smooth externally, pear-shaped, and about the size of an ordinary peach. It consists, first, of an outer fleshy covering, called the *pericarp*, which when mature separates into nearly equal longitudinal parts, or valves; secondly, of the *aril*, or *mace*, which, when recent, is of a bright scarlet colour; and thirdly, of the seed proper, or *nutmeg*. This is enclosed in a shell, which is made up of two coats: the outer is hard and smooth; the inner, thin, closely invests the seed, sending off prolongations, which enter the substance of the seed, and which, being coloured, impart the marbled or mottled appearance characteristic of nutmeg.

Nutmegs are cultivated in the Molucca Islands, and especially in those called the Banda, or Nutmeg Islands. It is also grown in Java, Sumatra, Penang, Singapore, Bengal, Bourbon Island, Madagascar, and certain of the West India Islands.

There are two kinds of nutmegs met with in commerce. The first, called the *true*, *round*, *cultivated*, or *female* nutmeg, is the product of *Myristica fragrans*. These nutmegs are characterised by their full and rounded form and delicate and aromatic flavour; they are occasionally imported in the shell. There is also a small variety, not larger than a pea, which has been described under the name of the *royal nutmeg*.

Three varieties of true nutmeg are distinguished by dealers, which are then described in Pereira's "Materia Medica:"—

"1. *Penang nutmegs.*—These are unlimed, or brown nutmegs, and fetch the highest price. They are sometimes limed here for exportation, as on the Continent the limed sort is preferred. According to Newbold, the average amount annually raised at Penang is 400 piculs (of 133⅓ lbs. each).

"2. *Dutch or Batavian nutmegs.*—These are limed nutmegs. In London they scarcely fetch so high a price as the Penang sort.

3. "*Singapore nutmegs.*—These are a rougher, unlimed, narrow sort, of somewhat less value than the Dutch kind. According to Mr. Oxley, 4,085,361 nutmegs were produced at Singapore in 1848, or about 252 piculs (of 133⅓ lbs. each); but the greater number of the trees had not come into full bearing, and it was estimated that the amount would, in 1849, be 500 piculs."

The second kind of nutmeg is called the false, *long*, *wild*, or *male* nutmeg, and is the produce chiefly of *Myristica fatua;* but a kind of nutmeg which is also called wild, is obtained from *Myristica Malabarica*.

The seeds of *Myristica fatua* are about half as long again as the true or round nutmeg; they are paler, and less aromatic.

The wild nutmeg obtained from the *Myristica Malabarica* has scarcely any flavour or odour, and, according to Rheede, is of the size and figure of a date. "The Turkish and Jewish merchants," writes Rheede, "mix these nutmegs with the true long ones, and the mace with good mace, selling them together. They also extract from these inferior articles an oil, with which they adulterate that of a more genuine quality."*

In the Banda Islands, three crops or harvests of nutmegs are obtained in the year; the principal gathering is in July or August; the second in November; and the third in March or April.

---

* Hist. Malab.

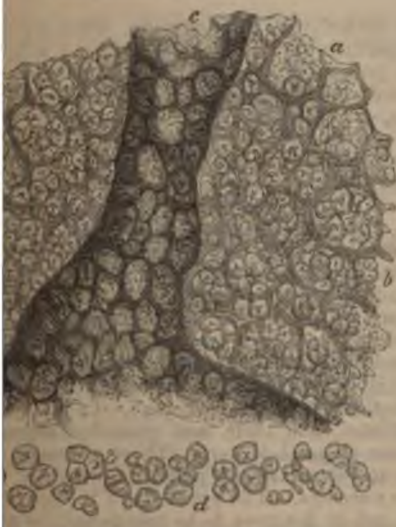
is gathered by means of a barb attached to a long stick; the mace l from the nut, and separately cured.

nt of their liability to the attacks of an insect known as the *nutmeg-* iderable care is required in drying them. They should be dried in , as they are then secure from the insect. They are placed on l smoke-dried over a slow wood fire for about two months. In the nds, they are first dried in the sun for a few days. When the f drying is complete, the nuts rattle in their shells; these are th mallets, and the damaged, shrivelled, or worm-eaten nuts re-

vent the attacks of the insect, the nuts are frequently limed. For market, however, the brown or unlimed nutmegs are preferred. lime them by dipping them into a thick mixture of lime and water; ocess is considered to injure their flavour. Others lime them by em with recently-prepared, well-sifted lime. This process is practised in London." *

, under the microscope, present peculiarities of structure, by which e distinguished, even in powder, from most other vegetable productions. A thin section, viewed under an object-glass magnifying 220 diameters, is seen to consist of minute angular cells. Those forming the white or *uncoloured* part of the nut, present, previous to the action of water upon them, an opalescent appearance, from the quantity of oil enclosed in them; their cavities contain in addition much starch, in the form of small but distinct granules, mostly of a rounded shape; but occasionally a few of the granules are angular; and all have well-marked central depressions.

Fig. 125.
SECTION OF NUTMEG.
(Magnified 220 diameters.)



ming the white or uncoloured portions of the ey are seen to contain numerous starch-granules. arch-granules. *c.* A portion of one of the veins he inversion of the inner coat of the seed-vessel or ; it consists of coloured cells, containing oil only. rch-granules magnified 420 diameters.

The cells forming the *coloured*, vein-like portion of the nut, differ from the other cells in colour and in being destitute of starch, containing apparently only a small quantity of oil.

Since nutmegs are never sold in the powdered state they are not liable to adulteration by admixture with edients, like several of the spices which have been already noticed, innamon, and cassia; nevertheless, they are subjected to a process rs their value and quality as much as though they had been actually in the same manner.

contain both a fixed and a volatile oil. The *fixed oil* is prepared by nutmegs to a paste; this is subjected, enclosed in a bag, to the ater, and the oil afterwards expressed by means of heated plates. ted in cakes which have somewhat the size and form of common are covered with leaves. The fixed oil procured in this manner contains a portion of the volatile oil, and from which its colour and fragrant odour are derived.

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* Pereira's Materia Medica, 2nd edit., vol. i. part ii. p. 1334.

The *volatile oil*, on the presence of which the flavour and aroma of nutmegs principally depend, is procured by distillation in water; the produce thus obtained at Apothecaries' Hall, London, is usually 4·5 per cent. Now, nutmegs are frequently deprived of a portion of their essential oil by distillation, and, after being well limed, are again sent into the market in this comparatively valueless state.

When nutmegs feel light, are dry and brittle, and if on the surface small punctures appear, it is certain that a great portion of their essential oil has been abstracted.

It is singular that the starch granules of nutmeg are but little affected by boiling; so that this means of discrimination, so satisfactory in the case of cinnamon, cassia, and some other spices, is of little or no value in the present instance.

Of this remarkable circumstance it is not easy to afford an explanation; it probably depends upon the difficulty with which the boiling water makes its way into the substance of the nut, in consequence of its hard texture and the large quantity of fixed oil contained in it.

The work of M. Chevallier, entitled "Dictionnaire des Altérations et Falsifications des Substances Alimentaires, Médicamenteuses, et Commerciales," in treating of nutmegs, contains the following observations, under the head of "Falsifications:"*—

"Nutmegs are sometimes mixed with riddled nuts, eaten by insects, and become brittle; the small apertures are then closed with a kind of cement, formed of flour, oil, and the powder of nutmegs. This paste has even served to fabricate false nutmegs, inodorous and insipid. The workmen of Marseilles have even made them of bran, clay, and the refuse of nutmegs: these nutmegs, placed in contact with water, soften down in that liquid.

"The worm-eaten nuts are equally insipid, and almost inodorous; sometimes they have a mouldy odour."†

"The jealous policy of the Dutch," writes Mr. M'Culloch, "has reduced the trade in nutmegs to a mere trifle compared to what it would otherwise have been. They have at least, in so far as it was possible, exerted themselves to exterminate the nutmeg plants everywhere except in Banda. They bribe the native princes of the surrounding islands to root out the trees, and annually send a fleet to see that the work of destruction has been effected, and that the bribes have not been bestowed in vain. To engage in an illicit trade in spices is *death* to an inferior person, and *banishment* to a noble; and yet, notwithstanding these tremendous penalties, it is supposed that about 60,000 lbs. of nutmegs and 15,000 lbs. of mace are clandestinely exported each year. In Banda the original inhabitants have been expatriated, and their land parcelled amongst settlers from Holland, under the name of *park-keepers*. These persons, who may be turned out of their farms on the most trifling pretext, have about 2000 slaves, who cultivate and prepare the nutmegs. The prices paid to the cultivators are all fixed by the government; and it deserves to be mentioned, as affording one of the most striking illustrations of the ruinous effects of monopoly, that the fixed price which the government is now obliged to pay for nutmegs is *five times greater than the price at which they bought them when the trade was free.* Such is a rough outline of that system which has reduced what used to be one of the most important branches of Eastern commerce so low, that it is unable to afford employment for the capital of a single wealthy merchant. We cannot conceive how so enlightened and liberal a government as that of Holland should continue to tolerate such scandalous abuses,—abuses destructive alike of the rights of those subjected to its authority in the East, and the commerce and wealth of its subjects at home."—("Modern Universal History," vol. x. p. 457–467, 8vo. edition; and "Crawfurd's Eastern Archipelago," vol. iii. p. 394—413.)

"Mr. Crawfurd estimates the produce of the Banda Islands at about 600,000 lbs. of nutmegs, and 150,000 lbs. of mace.

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* Tome ii. p. 76.

† "Some years since, an English captain arrived from Canton with a cargo of Nutmegs made in *white wood*, perfectly imitated."—(JOBARD of Brussels.)

"During the period that the English had possession of the spice islands, nutmeg plants were carried to Penang, Bencoolen, and some of the West India Islands. In the latter, they have altogether failed, at least as far as respects any useful purpose; but very good nutmegs, and in very considerable quantities, are now raised at Penang and Bencoolen. Mr. Crawfurd, however, alleges that the cost of bringing them to market is there so high, that the restoration of a free culture in the native country of the nutmeg would instantly destroy this unstable and factitious branch of industry."

The Dutch even attempted to confine the growth of nutmegs to three of the Banda islands, but in this attempt, strange to say, they were in a great measure frustrated by means of a pigeon called the *nut-eater*, or *nutmeg-bird*. This pigeon, having extracted the nuts, with the mace attached, from their fleshy coverings, swallows them. The mace is digested, but the nuts pass uninjured, and being deposited here and there, and often in distant places, readily take root: the plants thus disseminated are gathered together and transferred to the plantations or nutmeg-parks.

Not content, however, with endeavouring to monopolise the whole trade, in order to keep up the price of this spice, the Dutch were in the habit, whenever the crop was superabundant, of destroying, by burning, large quantities of nutmegs.*

The following account is extracted from M'Culloch's Dictionary of Commerce:—

"An Account of the Quantities of Nutmegs entered for Home Consumption in the United Kingdom in 1840, 1841, 1842, and of the Amount of Duty received thereon:—

Quantities.		Duties.		
	lbs.		£	s.
1840	118,664	1840	15,041	9
1841	113,441	1841	14,851	10
1842	170,064	1842	22,018	12

In 1842, the duties were fixed at 3*s*. 6*d*. per lb. on those from a foreign, and at 2*s*. 6*d*. per lb. on those from a British possession. The duty on wild nutmegs, in the shell, was then also fixed at 3*d*., without regard to origin."

The distinction of nutmegs into genuine and false, cultivated and wild, is entirely artificial; for they are both cultivated, the differences existing between them being chiefly those of quality.

The great disparity in the duty imposed on each, it might be supposed, would have the effect of bringing into the market, in large quantities, the inferior description, to the exclusion of the superior variety. We believe, however, that but few wild nutmegs are met with in the English markets.

It is to be hoped that government will ere long see the propriety of reducing the exorbitant duty of 3*s*. 6*d*. and 2*s*. 6*d*. per lb., now charged on the best description of nutmegs. We believe that were the duty to be brought down to 1*s*. per lb., the revenue would suffer no diminution in consequence of such reduction.

The wholesale price of nutmegs varies from 1*s*. 3*d*. to 3*s*. 6*d*. per lb.; so that the duty about doubles the cost of the article as charged to the public. (See Note, page 412.)

Results of the Examination of Eighteen Samples of NUTMEGS,

Purchased at the Establishments of various Grocers and Oilmen resident in the Metropolis.

1st Sample.— Purchased of —— Field and Co., 9. Walworth-road.
Examination. — Unlimed, volatile oil not extracted.
2nd Sample. — Purchased of Dannan and Co., 2. Walworth-road.
Examination. — Unlimed, oil not extracted.

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* Hooker's Botanical Magazine, vol. i., N. S. i. 1827, t. 2756-2757; also, Stephenson and Churchill's Medical Botany. vol. iii. pl. 104.

3rd Sample. — Purchased of W. P. Moore, 4. Crown-row, Walworth.
Examination. — Unlimed, oil not extracted.

4th Sample. — Purchased of T. F. Probyn, 17. Cross-street, Walworth-road.
Examination. — Unlimed, oil not extracted.

5th Sample. — Purchased of J. Jackson, 75. Blackman-street, Borough.
Examination. — Limed, oil not extracted.

6th Sample. — Purchased of Mitchell and Co., 17. Blackman-street, Borough.
Examination. — Unlimed, oil not extracted.

7th Sample. — Purchased of Newsome and Williams, 50. High-street, Borough.
Examination. — Unlimed, oil not extracted.

8th Sample. — Purchased of Russell and Co., 72. Borough.
Examination. — Unlimed, oil not extracted.

9th Sample. — Purchased of R. Jones, 16. Borough.
Examination. — Unlimed, oil not extracted.

10th Sample. — Purchased of T. Rose and Co., 213. Borough.
Examination. — Unlimed, oil not extracted.

11th Sample. — Purchased of Gluckner and King, 11. Mount-row, Liverpool-road, Islington.
Examination. — Limed, oil not extracted.

12th Sample. — Purchased of J. Barber, 14. Rufford's-buildings, Islington.
Examination. — Unlimed, oil not extracted.

13th Sample. — Purchased of Mr. Irvine, Camden-passage, Islington.
Examination. — Unlimed, oil not extracted.

14th Sample. — Purchased of William Nicholson, 86. Upper-street, Islington.
Examination. — Unlimed, oil not extracted.

15th Sample. — Purchased of W. Young and Son, 27. High-street, Islington.
Examination — Unlimed, oil not extracted.

16th Sample. — Purchased of Alexander Braden, 13. High-street, Islington.
Examination. — Unlimed, oil not extracted.

17th Sample. — Purchased of C. Young, 8. High-street, Islington.
Examination. — Unlimed, oil not extracted.

18th Sample. — Purchased of S. Austin, 3. Old Compton-street, Soho.
Examination. — Unlimed, oil not extracted.

It thus appears: —

1st. That nutmegs as they reach the consumer are not in general deprived of their essential oil; a result contrary to the opinion commonly entertained on this point.

2nd. That, as met with in the English markets, they are seldom limed.

NOTE. — The duty *now* is 1*s.* per lb.; on wild nutmegs in the shell, 3*d.* per lb.; not in the shell, 5*d.* per lb. Wholesale price, 1*s.* 9*d.* to 4*s.* Were entered for home consumption in 1852, 239,200 lbs.; in 1853, 208,198 lbs.

MACE.

MACE, as already noticed, forms around the shell of the nutmeg a fleshy, branching, and, when recent, bright scarlet covering; in the process of drying it changes to yellow, orange-yellow, or what is considered best, golden-yellow, and becomes transparent and horny.

It is prepared by drying in the sun for some days. The *aril* is sometimes flattened out, and dried in a single layer, but frequently it is pressed together, in which case it forms two layers. The Dutch sprinkle mace with salt water prior to packing it in sacks.

As there are two kinds of nutmeg, so are there two kinds of mace, the produce of the same plants: thus, there is true, or cultivated mace; and false, or wild mace.

"The London dealers distinguish three sorts of *true* mace: —

"1. *Penang Mace.* — This fetches the highest price. It is flaky and spread. The annual quantity produced in Penang is about 130 piculs (of 133⅓ lbs. each).

"2. *Dutch, or Batavian Mace.* — This is a fleshy sort. It scarcely fetches so high a price as the Penang sort.

ipore Mace. — This is a somewhat inferior kind." *

false mace is of a dark-red colour, and deficient in flavour and

ader the microscope, mace presents a structure very distinct from utmeg itself.

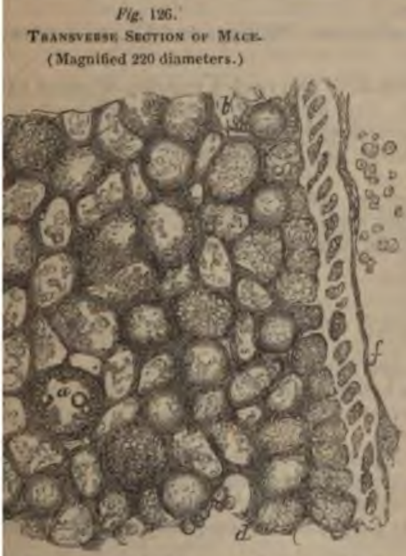
the surface of the blades is a delicate membrane consisting of a of cells; they are tubular, much elongated, taper at either end to a esemble in size and form, although not in delicacy of texture, ody fibre. The long diameters of the cells are disposed vertically ce of the mace.

iief substance is made up of other cells differing in size and form lready noticed; these contain fixed oil, and much starch.

Fig. 126.

TRANSVERSE SECTION OF MACE.

(Magnified 220 diameters.)



es for the essential oil; many of them appear in the pertures, and are represented in the figure as such. ne, exhibiting the appearance of closed cells, from the of their not being cut into; the colouring matter of ted chiefly in these cells or receptacles. *c c.* Large usually observed in sections immersed in water. led with starch-corpuscles. *e.* The starch-corpuscles fied 420 diameters. *f.* The cells forming the delicate le, investing mace.

Imbedded in the midst of these cells are larger cells, spaces, or *receptacles*, which, in thin sections, whether made crosswise or lengthwise, appear as apertures. These contain the essential oil of mace.

Scattered here and there may be seen, both in transverse and longitudinal sections, small bundles of woody fibre, of a brownish colour, enclosing one or two small spiral vessels. In transverse sections, the ordinary starch cells are perceived to be arranged round the bundles in a radiate manner.

The structure of mace is exhibited in the annexed wood-cut:—

Like the nutmeg, mace may be deprived, by distillation, of its essential oil.

In some cases, wild or false mace is sold for, or admixed with, cultivated or true mace.

ESULTS OF THE EXAMINATION OF TWELVE SAMPLES OF MACE,

AT THE ESTABLISHMENTS OF VARIOUS GROCERS AND OILMEN RESIDENT IN THE METROPOLIS.

— Purchased of Messrs. Harvey and French, 227. Oxford-street.
ion. — Genuine.
— Purchased of Messrs. Houle and Co., 282. Oxford-street.
ion. — Genuine.
— Purchased of Messrs. Strugnell and Co., 221. Oxford-street.
ion. — Genuine.
— Purchased of R. Hall, 70. Wardour-street.
ion. — Genuine.

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* Pereira's Materia Medica, 2nd edit., vol. ii. part i. p. 1336.

5th Sample. — Purchased of C. Legg, 18. Wardour-street.
Examination. — Genuine.
6th Sample. — Purchased of C. Cream, 31. Lisle-street.
Examination. — Genuine.
7th Sample — Purchased of Smith and Co., Grafton-street, Soho.
Examination. — Genuine.
8th Sample. — Purchased of J. Harris, King-street, Soho.
Examination. — Genuine.
9th Sample. — Purchased of C. Wilson, 44. Carnaby-street.
Examination. — Genuine.
10th Sample. — Purchased of J. Huddert, 15. Tyler-street.
Examination. — Genuine.
11th Sample. — Purchased of W. Gilbert, 20. Silver-street, Golden-square.
Examination. — Genuine.
12th Sample. — Purchased of Messrs. Phillipps and Co., 3. Foubert's-place.
Examination. — Genuine.

It thus appears that the whole of the twelve samples of mace examined were genuine. Much difference was observed in the quality of several of the samples; but, in accordance with our usual practice, we refrain from instituting comparisons respecting quality, our purpose being to detect and expose adulteration.

The duty on genuine mace was nearly the same as that on nutmegs — namely, 2*s*. 6*d*. per pound, and five per cent. It is now 1*s*. per lb. Wholesale price, 2*s*. to 2*s*. 6*d*. ex. duty. Entered for home consumption in 1852, 21,485 lbs.; in 1853, 23,558 lbs.

CLOVES, AND THEIR ADULTERATIONS.

Cloves are the unexpanded flower-buds of *Caryophyllus aromaticus*, a tree from fifteen to thirty feet in height, one of the Myrtaceæ or myrtle tribe. The word *clove* is derived from *clou* — French for nail, from a fancied resemblance to a nail in the form of the clove.

The flower-buds are arranged on terminal flower-stalks; they are either gathered by hand or obtained by beating with bundles of reeds, in which case cloths are spread beneath the trees to catch them; they are afterwards dried either by the fire, or, what is better, in the sun; they are imported in casks or bags.

The native habitat of the clove-tree is the *Molucca Islands*, to which the Dutch, following their usual policy, endeavoured unsuccessfully to limit its cultivation; it is now, however, grown in *Sumatra*, the *Mauritius*, *Cayenne*, *Bourbon*, *Martinique*, and *St. Vincent*.

Cloves of good quality should be dark-coloured, heavy, aromatic, pungent, and when strongly pressed upon with the nail, the oil should freely exude. Moreover, the rounded heads or flower-buds should not be absent.

Several varieties of clove are distinguished in commerce, according to the name of the place in which they are produced. Those from *Amboyna* and *Bencoolen*, two of the Spice Islands, are the best, the *Bencoolen* clove being most esteemed. They are large, heavy, and contain the greatest quantity of oil. *Bourbon* and *Cayenne* cloves are smaller, somewhat shrivelled, and yield less oil. *Cayenne* cloves are the least valuable.

The following varieties of clove are described in the "Dictionnaire des Altérations et Falsifications des Substances Alimentaires," tome i. p. 395.: —

> "*The English Clove* is most esteemed; it is plump, short, and of a brown r, sometimes slightly greyish; the odour is powerful, and of a flavour and very aromatic.
>
> *he Cayenne Clove* is long, somewhat large, of a brown colour, and of an less powerful than the preceding.
>
> *he Clove of Bourbon*, and of the *Island of France*, is small, short, of a ep colour, and of a less strong odour, than the clove of Cayenne. Like st, it is often mixed with the broken foot-stalks of clove, known under the f *griffes de girofle*, in the form of small, broken, and greyish-brown

, of a flavour and odour well marked, but they contain much less
il than the cloves themselves.

Clove of Holland is of a deep brown colour, with an oily appearance,
ng odour, and an acrid and aromatic flavour.

Clove of Batavia is very dry, of a grey colour, and appears to have
ered with plaster or lime (perhaps with *talc ?*).

Clove of St. Lucia is of a whitish-yellow colour, and resembles the
clove, with which it is frequently mixed."

contain, according to the Analysis of Trommsdorf,* *volatile oil*, 18;
steless resin, 6; *tannin*, 13; *difficultly-soluble extractive with tannin*, 4;
; *woody fibre*, 28; and *water*, 18.

latile oil is obtained from cloves by repeated distillation. The yield on
ge is said to be from seventeen to twenty-two per cent.

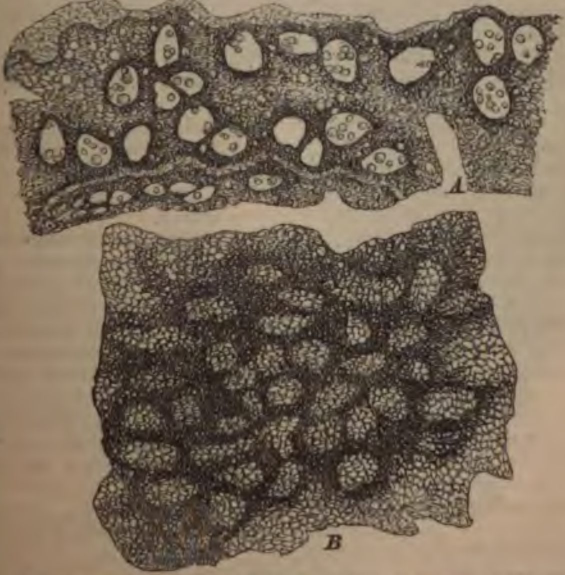
been ascertained that the oil which was formerly regarded as a simple
lly composed of two volatile oils, possessing different qualities, one of
lighter, and the other heavier than water.

aracters and composition of these oils are thus given in Pereira's
a Medica," ed. 1. part ii. p. 1093. :—

ight Oil of Cloves (*Clove-Hydro-Carbon*). — Colourless sp. gr. 0·918.
e of combining with bases, but absorbing hydrochloric acid gas without
a crystalline compound. It consists of C_{10} H_8; hence it is isomeric
of turpentine.

leavy Oil of Cloves (Clove Acid; Engenic Acid).—It is colourless
cently prepared, but becomes coloured by age. Its specific gravity,
g to Bonastre, is 1·079. It combines with alkalies to form crystalline
aline eugenates, clove-oil alkalies). If a salt of iron be added to one
it yields a blue, violet, or reddish compound (*a ferruginous eugenate*),
somewhat according to the nature of the ferruginous salt used; thus the
phate of iron yields a lilac, the persulphate a red, which becomes violet

Fig 127.
PETAL OF CLOVE-BUD.
(Magnified 60 diameters.)



A. Transverse section of the petal of flower-bud of clove, showing the receptacles in which the essential oil is contained. *B*. Surface of petal; the receptacles for the oil in this view are indistinct.

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* Gmelin, Handb. d. Chem., ii. 1272.

and afterwards blue; while the sesquichloride gives a vinous, which turns to red (Bonastre). Nitric acid reddens clove acid."

The unexpanded flower-buds are not the only parts of the tree which are aromatic, as the footstalks and fruit or seed vessels are likewise so to some extent.

The peduncles, or *footstalks*, according to Guibourt, are sometimes substituted for cloves by distillers of the oil.

The fruit, *mother-cloves* as they have been called, are occasionally met with in commerce; they have the shape of the olive, but are smaller, and possess the odour and taste of the clove in a mild degree.

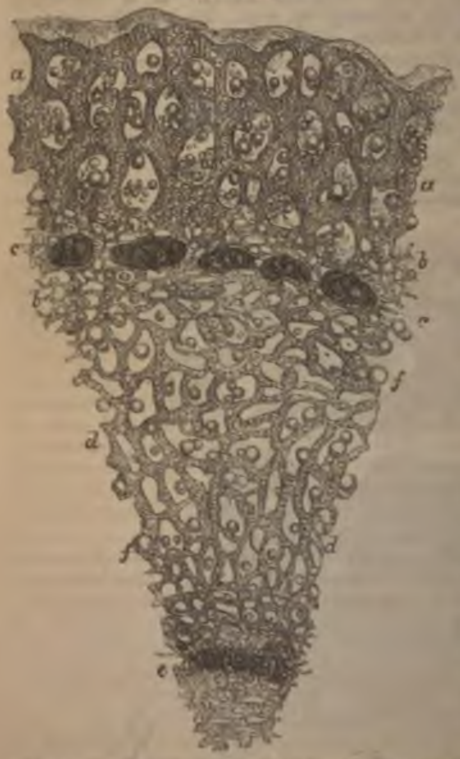
The minute structure of cloves is extremely characteristic. The rounded head or *bud* consists of the unexpanded petals; if a transverse section of one of these be made, it will be seen to be composed of cellular tissue, in the midst of which are numerous receptacles for the essential oil; these extend through the whole thickness of the leaf, being usually three or four deep.

When the petal is viewed on the surface, the receptacles are seen but indistinctly, being obscured by the cellular tissue of which the surface of the petal is formed. *Fig.* 127.

Fig. 128.

TRANSVERSE SECTION OF FLOWER-STALK OF THE CLOVE.

(Magnified 60 diameters.)



a. Receptacles for the essential oil; the section being a thin one, they present the appearance of apertures, in consequence of being opened into. *b b*. Cellular tissue surrounding the woody-fibre. *c c*. Bundles of woody-fibre. *d*. The tubular structure and interspaces, of which the internal portion of the stalk is formed. *e*. The centre of the stalk; it appears dark under the microscope, the structure being obscure. *f f*. Droplets of oil.

In a transverse section of the *flower-stalk*, viewed with an object-glass of one-inch focus, the following appearances present themselves:—

In the outer third of the section, numerous large holes are observed; these are the divided receptacles; next to these, passing inwards, are bundles of woody fibre, forming a narrow circle in the interior of the stalk; extending from these to near the centre of the stalk is a tissue formed of numerous tubular cells, with large spaces between them. The receptacles, as well as the tubular cells and interspaces, contain essential oil, visible in sections immersed in water, in the form of innumerable droplets. *Fig.* 128.

Longitudinal sections exhibit a nearly similar structural arrangement. *Fig.* 129.

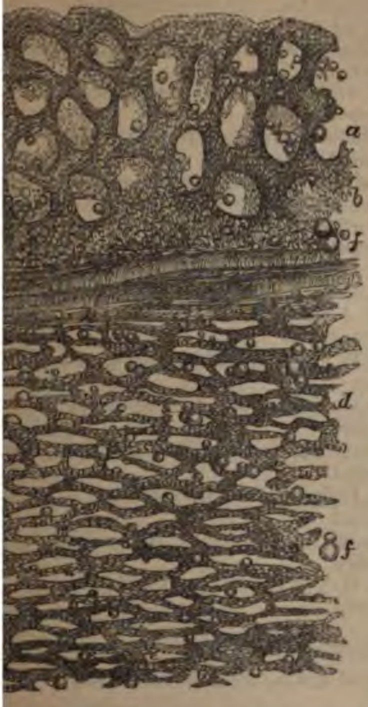
Cloves contain scarcely any starch.

The quality and value of cloves are not unfrequently impaired, like some other spices, by the abstraction of the essential oil. Cloves which have been thus deprived of their active properties, are distinguished by being light, shrivelled, not yielding oil when pressed upon, possessing but little aroma or taste, and by the frequent absence of the flower-bud.

This fraud used to be extensively practised in Holland, the *drawn* cloves, for more effectual concealment, being mixed with others of good quality; and even, in some instances, the trouble being taken to restore as nearly as the exhausted cloves their original appearance, by rubbing them me common oil.

Fig. 129.

. SECTION OF FLOWER-STALK OF THE CLOVE.
(Magnified 60 diameters.)



s for the essential oil, appearing as apertures been cut into in making the section. *b*. Cellular oody-fibre. *d*. The tubular structure and inter- form the internal portion of the stalk. *c*. The part of the flower-stalk. *ff*. Droplets of oil.

The volatile oil itself, as imported into this country from India, has been found to be adulterated.

Mr. M'Culloch, on the authority of Milburn, states that the oil imported from India contains nearly half its weight of an insipid expressed oil, which is discovered by dropping a little into spirits of wine, and on shaking it the genuine oil mixes with the spirit, and, the insipid separating, the fraud is detected.

Cloves readily imbibe moisture, whereby their weight becomes greatly increased, a fact of which dishonest dealers have not failed to avail themselves.

Cloves are but seldom sold in powder, and hence the liability to adulteration is greatly lessened: they are, however, occasionally met with in that state.

Clove-stalks, although very inferior, contain some of the active properties of cloves, and, as already noticed, are occasionally used by distillers for procuring the essential oil of cloves. We have reason to believe that in some cases the stalks are ground up, and mixed with the powder of genuine cloves: this sophistication can be readily detected in a most satisfactory manner.

The clove-stalks present a structure somewhat similar to es themselves; that is, they consist of cellular tissue, hollowed out ere into receptacles for the essential oil; but, in addition, the stalks d with an epidermis, or coating of the stellate cells, which are of nt occurrence in different kinds of bark.

ese cells, therefore, are found to occur in considerable abundance in of powdered cloves, the other tissues met with being those of clove, doubt but that a proportion of ground stalks has been introduced.

F THE MICROSCOPIC EXAMINATION OF TWENTY-NINE SAMPLES OF CLOVES,

ED AT THE ESTABLISHMENTS OF VARIOUS GROCERS AND OILMEN RESIDENT IN THE METROPOLIS.

WHOLE CLOVES.

—Purchased of J. Button, 76. Wardour-street.
tion.— Essential oil not extracted.

2nd *Sample.* — Purchased of G. James, 72. Wardour-street.
Examination. — Oil not extracted

3rd *Sample.* — Purchased of W. Sykes, 34. Old Compton-street.
Examination. — Oil not extracted.

4th *Sample.* — Purchased of S. Austin, 3 Old Compton-street.
Examination — Oil not extracted.

5th *Sample.* — Purchased of Smith & Co., 1. Coventry-street.
Examination. — Oil not extracted.

6th *Sample.* — Purchased of J. Waltham, 6. Edward-street, Soho.
Examination. — Oil not extracted.

7th *Sample.* — Purchased of W. Oulds, 28. Peter-street, Soho.
Examination. — Oil not extracted.

8th *Sample.* — Purchased of Palmer & Co., 29. Grafton-street, Soho.
Examination. — Oil not extracted.

9th *Sample.* — Purchased of Alexander Braden, 13. High-street, Islington.
Examination. — Oil not extracted.

10th *Sample.* — Purchased of J. Hanks, 27. Little Newport-street.
Examination. — Oil not extracted.

11th *Sample.* — Purchased of G. Mills, 35. Little Earl-street.
Examination. — Oil not extracted.

12th *Sample.* — of J. Taylor, 10. Jermyn-street.
Examination. — Oil not extracted.

13th *Sample.* — Purchased of J. W. Stalman, 4. Jermyn-street.
Examination. — Oil not extracted.

14th *Sample* — Purchased of Jones & Co., 166. Oxford-street.
Examination. — Oil not extracted.

15th *Sample.* — Purchased of Russell & Co., 22. King-street, Covent-gard
Examination. — Oil not extracted.

16th *Sample.* — Purchased of E. Folkard, 40. Drury-lane.
Examination. — Oil not extracted.

17th *Sample.* — Purchased of James Appleton, 174. Drury-lane.
Examination. — Oil not extracted.

18th *Sample.* — Purchased of J. Way & Co., 272. Oxford-street.
Examination. — Oil not extracted.

CLOVES IN POWDER.

19th *Sample.* — Purchased of Field & Co., 9. Walworth-road.
Examination. — Genuine.

20th *Sample.* — Purchased of R. Jones, 16. Borough.
Examination. — Genuine.

21st *Sample.* — Purchased of Harrington & Lucas, 11. High-street, Borou
Examination. — Genuine.

22nd *Sample.* — Purchased of Beckett & Young, 3. High-street, Islington.
Examination. — Genuine.

23rd *Sample.* — Purchased of Roberts & Arnold, 1. Rosomon-buil
Islington.

Examination. — Powder presenting the appearance of mixed snuff, being
dark, dull-brown colour, possessing but little aromatic smell, but pu
to the taste. Examined with the microscope, numerous *stellate cel*
discoverable in it, showing that some of the stalks or "*griffes*" of
have been ground up with it. It is evident, on a careful examination,
the article consists of a mixture of two powders of different colour
one having the reddish hue characteristic of genuine powdered c
the other being of a dark-brown colour.

24th *Sample.* — Purchased of C. Young, 8. High-street, Islington.
Examination. — Genuine. Examined under the microscope, numerous
of pepper were detected in this sample; the presence of these is pro
to be explained by the circumstance of the cloves having been grou
a pepper-mill.

25th *Sample.* — Purchased of Messrs. Smith & Co., 2. Grafton-street.
Examination. — Genuine.

Sample.—Purchased of C. Collins, 66. Dean-street.
xamination.—Genuine.
Sample.—Purchased of J. Stalman, 4. Jermyn-street.
xamination.—Genuine.
Sample.—Purchased of Waller & Co., 5. Berwick-street, Oxford-street.
xamination.—Genuine.
Sample.—Purchased of W. Cox, 3. Rose-street, Long-acre.
xamination.—Genuine, but containing some rice and numerous pepper cells, both derived probably from the mill in which the spice was ground.

rom the foregoing analyses it thus appears:—

st. That whole cloves, as ordinarily met with, are not deprived of any tion of their essential oil. There is little doubt, however, that this fraud is ctised in some cases; but it is satisfactory to find that it does not prevail to considerable extent. As in the case of some of the other spices, many of samples examined presented a great variation in condition and quality.

nd. That the whole of the powdered cloves were free from adulteration. of the samples contained, however, a proportion of ground clove-ks.

he following remarks on the policy pursued by the Dutch with regard to this e are extracted from the "Dictionary of Commerce:"—

From the expulsion of the English from Amboyna, in 1623, the Dutch have few short intervals only excepted—enjoyed the exclusive possession of the ucca or Clove Islands. In their conduct as to the clove trade, they have ibited a degree of short-sighted rapacity which has been, we believe, seldom lled, even in the annals of monopoly. Their object has not been to en-age the growth and trade of cloves, but to confine both within the narrowest ts. They have preferred deriving a large profit from a stunted and petty e, to a moderate profit from a trade that might have afforded employment for a large amount of capital; and to prevent their narrow and selfish projects being counteracted by the operations of the natives, they have subjected to the most revolting tyranny. 'That they might,' says Mr. Crawfurd, ulate and control production and price just as they thought proper, the clove were extirpated everywhere but in Amboyna, the seat of their power, and urrounding princes were bribed, by annual stipends, to league with them for lestruction of their subjects' property and birthright. This plan was begun t the year 1551. 'The contracts are still in force, and an annual fleet visits urrounding islands to suppress the growth of cloves, which, in their native try, spring up with a luxuriance which these measures of Satanic rigour, of sacrilege towards bountiful nature, can scarce repress. By the plan on h the clove trade is now conducted,—a plan carried into effect through so iniquity and bloodshed,—the country of spices is rendered a petty farm, hich the natural owners are reduced to the worst condition of predial ry; and the great monopoliser and oppressor is that government whose it should have been to insure freedom and afford protection. Human uity could hardly devise a plan more destructive of industry, more hostile e growth of public wealth or injurious to morals, than this system, framed barbarous age; and it reflects disgrace upon the character of a civilised ple to persevere in it.

It is curious to remark how the monopolisers, in carrying the details of this em into effect, at once impose upon the natives, and deceive themselves. *nominal price* paid to the natives is actually above the natural price of the modity, but they are cheated in the details. The cultivator brings his luce to the public stores, where it is subjected at once to a deduction of one-for payment of the salaries of the civil and military officers. The price of remainder is fixed at the rate of 9·6 Spanish dollars the picul; but before ment is made, another deduction of one-fifth is made; one-half of which is he chiefs or *Rajahs*, and the other for the native *elders*, who are overseers e forced culture. The real price, therefore, paid to the grower is 8 Spanish dollars per picul, or 8¼d. per lb. avoirdupoise, instead of 11$\frac{38}{100}$ Spanish do per picul, or 4½d. per lb., which is pretended to be given.

"When cloves have been sold on the spot, the price usually exacted has about 64 Spanish dollars the picul, or eight times the price paid to the c vator. The average price in Holland, previous to the war of the French R lution, may be taken at 6s. per lb., or 177$\frac{1}{100}$ Spanish dollars per picul; b 2122 per cent. advance on the real cost of the commodity in the place o growth. When brought direct to England, they have cost, at an aver 8s. 8d. per lb., making 108$\frac{4}{10}$ Spanish dollars per picul, an advance on natural export price of 1258 per cent." ("Eastern Archipelago," vol pp. 888—890).

"*The* duty on cloves was considerably reduced in 1819, and there has bee consequence, a considerable increase in the consumption of the article, th not nearly so great as it would have been, had it been supplied under a liberal system. At an average of the three years ending with 1842, the en of cloves for home consumption amounted to 85,015 lbs. a year, produ annually 2219l. 4s. 1d. of revenue. The cultivation of cloves is carried some extent in Cayenne, but its culture there depends entirely on the exis of the present system in the Moluccas. The superiority which the latter over every other place in the production of cloves is so very great, that anything like freedom given to those engaged in their culture, they would speedily exclude every other from the market. It is not to be imagined th liberal and intelligent a government as that of Holland can much longer con insensible to the disgrace of supporting a system like the present, and many advantages which would result from its abolition."

In 1842 the duty on cloves was further reduced from three shillings per p to sixpence, and five per cent. It is now 2*d*. per lb., being again reduc 1853. Entered for home consumption in 1852, 175,287 lbs.; in 1853, 228,85 The prices of cloves in the market in bond, in 1851, were as follow Amboyna cloves, 7*d*. to 8*d*. per lb.; Penang, 10½*d*. to 1*s*. 1*d*.; Zanzibar, to 6¼*d*.

PIMENTO OR ALLSPICE, AND ITS ADULTERATIONS.

PIMENTO, JAMAICA PEPPER, OR ALLSPICE, is the berry or fruit of the *Eu Pimento*, one of the *Myrtaceæ*. It grows in the West Indies, and principal Jamaica, especially on the hills on the north side of that island. It for beautiful tree, which attains some thirty feet in height, and is planted in re walks, which are named *Pimento walks*.

"The returns," says Mr. Bryan Edwards, "from a pimento walk in a fa able season are prodigious. A single tree has been known to yield 150 l the raw fruit, or 100 lbs. of the dried spice, there being commonly a lo weight of one-third in curing; but this, like many other of the minor ductions, is exceedingly uncertain, and perhaps a very plenteous crop occur once in five years."*

The name of allspice is derived from its flavour, which is considered to combination of that of several of the other spices; it differs, however, from all in its great astringency.

The fruit is gathered after it has attained its full size, but while still gree is usually sun-dried, but sometimes kiln-dried on sheets: in drying, the c of the fruit changes from green to reddish-brown: when ripe, the berry bec black or dark purple in colour, and is glutinous, and consequently in that unfit for preservation.

Pimento is imported principally from Jamaica, in bags or hogsheads.

There is a second kind of pimento not ordinarily met with in commerce, is also a native of the West Indies; it is distinguished from the common pin by the form of the berries, which are ovate: the properties of the two kind nearly identical.

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* Vol. ii. p. 372, edit. 1819. See M'Culloch's Dictionary.

nastre*, in 1825, published the following analysis of the composition of
nto berries: —

	Husks.	Kernels.
Volatile oil - - - -	10·0	5·0
Green oil - - - -	8·4	2·5
Solid fat oil - - - -	0·9	1·2
Astringent extact - - - -	11·4	39·8
Gummy extract - - - -	3·0	7·2
Colouring matter - - - -	4·0	
Resinous matter - - - -	1·2	
Uncrystallisable sugar - - -	3·0	8·0
Mallic or gallic acid - - -	0·6	1·6
Lignin - - - - -	50·0	
Saline ashes - - - -	2·8	1·9
Water - - - - -	3·5	3·0
Loss - - - - -	1·6	1·8
Red matter insoluble in water - -	- -	8·8
Pellicular residue - - - -	- -	16·0
Brown flocculi - - - -	- -	3·2
Total - - -	100·0	100·0

mplicated and complete as the above analysis would appear to be, it yet
embrace the starch which is contained in the seeds in large quantity.
onnet, however, detected the presence of starch, and estimates it as forming
per cent. of the seeds.†

in the case of cloves, the essential oil of pimento is a mixture of two oils
light and a heavy oil. The properties of these are thus described in
ra's "Materia Medica:"‡

By distillation with water, allspice, like cloves, yields two volatile oils—the
ighter, the other heavier than water. The oil of pimento of the shops is a
ire of these; except in odour, its properties are almost identical with those
of cloves. By distillation with caustic potash, the *light oil* is separated;
esidue, mixed with sulphuric acid, and submitted to distillation, gives out
eavy oil."

. *Light Oil of Pimento* (*Pimento-Hydro-Carbon*) has not, to my know-
, been previously examined. Its properties appear to be similar to those of
ght oil of cloves. It floats on water and on liquor potassæ, and is slightly
ned by nitric acid. Potassium sinks in, and is scarcely, if at all, acted on

. *Heavy Oil of Pimento* (*Pimentic Acid*). — Very similar to clove-acid.
ms with the alkalies crystalline compounds (*alkaline pimentates*), which
ne blue or greenish on the addition of the tincture of the chloride of iron
g to the formation of a *ferruginous pimentate*). Nitric acid acts violently
d reddens it."

. Whipple estimates the yield of pimento oil to be about 4·37 per cent. of
eight of the seeds.

in the case of other seeds, the pimento berry is divisible into husk and
or seeds proper.

e husk is thick, and, when dried, soft and brittle; it sends off from its inner
ce a prolongation which forms a septum, and divides the interior into two
or cells.

rtical sections of the husk, viewed under the microscope, present the
wing structures.

the outer part of the section are seen several large cells or *receptacles* for
ssential oil, sometimes two or three deep; more internally, numerous
te cells, attached to and imbedded in cellular tissue, occur; next to these
undles of woody fibre, and delicate spiral vessels; while the deepest or
most part of the section consists of cellular tissue only.

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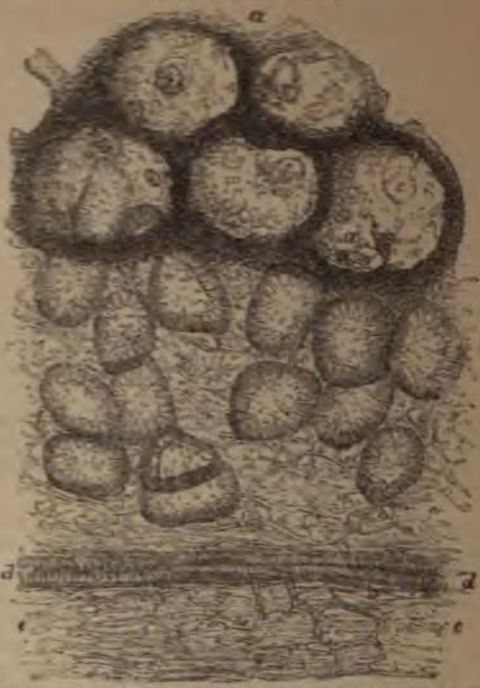
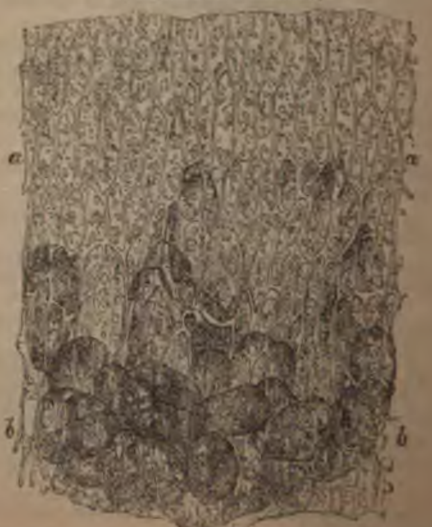
* Journ. de Chim. Méd. i. 210.
† Duncan, Edinb. Dispens.
‡ Part ii. p. 1096, edit. 1.

Fig. 130.
VERTICAL SECTION OF HUSK OF PIMENTO BERRY.
(Magnified 220 diameters.)



a. Cells or receptacles for the essential oil. *b*. Stellate cells. *c*. Cellular tissue surrounding the stellate cells. *d*. Bundles of woody fibre and spiral vessels. *e*. Cellular tissue forming the innermost part of the section.

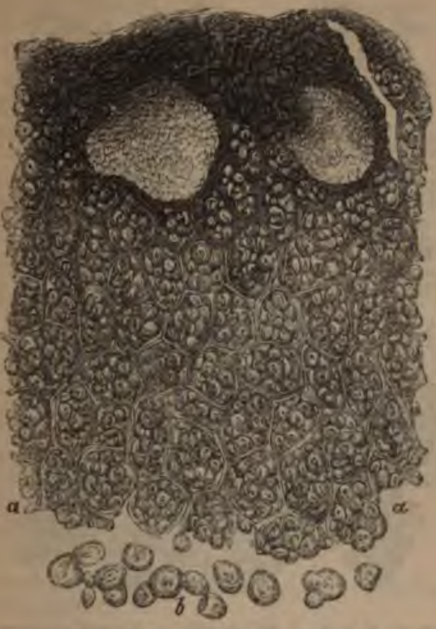
Fig. 131.
PORTION OF THE MEMBRANES ON SURFACE OF THE SEED PROPER.
(Magnified 220 diameters.)



a. External membrane, consisting of a single layer of elongated and angular cells.
b. Internal membrane, made up of several layers of large port-wine-coloured cells.

Fig. 132.

VERTICAL SECTION OF THE SEED PROPER, OF PIMENTO BERRY.
(Magnified 220 diameters.)



In the upper part of the figure, two of the *receptacles* for the oil are exhibited ; and in the lower part, *a a*, the cells containing the small rounded starch-corpuscles ; *b*, loose starch-corpuscles, magnified 420 diameters.

ıpying each of the cells formed by the husk, is a small flattish seed of a
rown or chocolate colour. After maceration, two membranes may be
ed, although with some difficulty, from the surface of the seed. The
xternal of these is thin and delicate, and consists of a single layer of
ed and angular cells. The internal tunic is composed of several layers
e corrugated and coloured cells; it is to these that the dark colour of the
of the seed is due; when viewed under the microscope, they exhibit a
eristic port-wine tint.

structure of the seed proper, as displayed in vertical sectons, is as
:—

ning round the outer part of the section is a single layer of large
cles, the remaining thickness being made up of angular and transparent
the cavities of which are filled with numerous well-defined starch-
s.

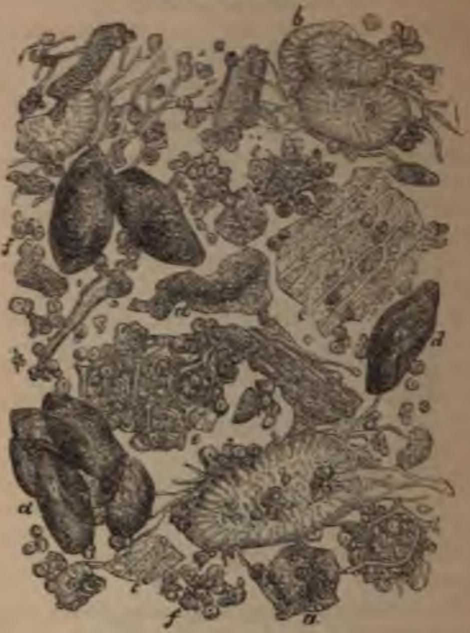
n pimento berries are reduced to powder, the whole of the foregoing
res become disunited, broken up, and variously intermixed. The port-
oloured cells are particularly conspicuous, and afford a character by which
ure of the powder may be at once determined.

several structures above mentioned, as they appear in genuine ground
o-powder or allspice, are represented in *fig.* 133. on the next page.

Fig. 133.

GROUND PIMENTO, OR ALLSPICE.

(Magnified 220 diameters.)



a. Fragments of husk. b. Stellate cells. c. External coat or membrane of seed proper. d. Port-wine-coloured cells, which form the second membrane of seed. e. Cells of the seed, which contain the starch-granules. f. Loose starch-corpuscles.

RESULTS OF THE MICROSCOPIC EXAMINATION OF TWENTY-ONE SAMPL
ALLSPICE,
OBTAINED AN THE ESTABLISHMENTS OF VARIOUS GROCERS AND OILM
THE METROPOLIS.

1st *Sample.*—Purchased of Dannan and Co., 2. Walworth-road.
Examination.—Genuine.

2nd *Sample.*—Purchased of Field and Co., 9. Walworth-road.
Examination.—Genuine.

3rd *Sample.*—Purchased of W. P. Moore, 4. Crown-row, Walworth-road
Examination.—Genuine.

4th *Sample.*—Purchased of T. F. Probyn, 17. Cross-street, Walworth.
Examination.—Genuine.

5th *Sample.*—Purchased of C. Roads, 11. Black-Prince-row, Walworth.
Examination.—Genuine.

6th *Sample.*—Purchased of Mitchell and Co., 17. Blackman-street, Boro
Examination.—Genuine.

7th *Sample.*—Purchased of J. Pringle, 35. Blackman-street, Borough.
Examination.—Genuine.

mple.—Purchased of W. Bourne, 109. Blackman-street, Borough.
nination.—Genuine.

mple.—Purchased of Newsome and Williams, 50. High-street, Borough.
nination.—Genuine.

ample.—Purchased of White and Co., 107. Borough.
mination.—Genuine.

ample.—Purchased of Harrington and Lucas, 113. High-street,
rough.
mination.—Genuine.

ample.—Purchased of Roberts and Arnold, 11. High-street, Islington.
mination.—Genuine.

ample.—W. Young and Son, 27. High-street, Islington.
mination.—Genuine.

ample.—Purchased of Alexander Braden, 13. High-street, Islington.
mination.—Genuine.

ample.—Purchased of H. Davis and Co., 23. High-street, Islington.
mination.—Genuine.

ample.—Purchased of W. Turner, 215. Whitecross-street.
mination.—Containing a small quantity of *ground ginger.*

ample.—Purchased of Mr. Hopkinson, Barbican.
mination.—Genuine.

ample.—Purchased of W. Clarke, 216. Whitecross-street.
lterated.—Containing a small quantity of *mustard*, the husk resembling
at of *black*.

ample.—Purchased of C. Cullingham, 84. Snow-hill.
mination.—Genuine.

ample.—Purchased of N. Yarrow, 42. King-street, Snow-hill.
mination.—Genuine.

ample.—Purchased of H. Sparrow, 216. Oxford-street.
mination.—Genuine.

us appears, that of the *Twenty-one* samples of ground Allspice submitted
nination, *one only was adulterated;* a result probably mainly attributable
great cheapness of this spice.

duty on *Pimento* is 5*s.* per cwt. Present wholesale price is 5¾*d.* to 6*d.*
Entered for home consumption in 1852, 3785 cwt.; in 1853, 3746 cwt.

MIXED SPICE, AND ITS ADULTERATIONS.

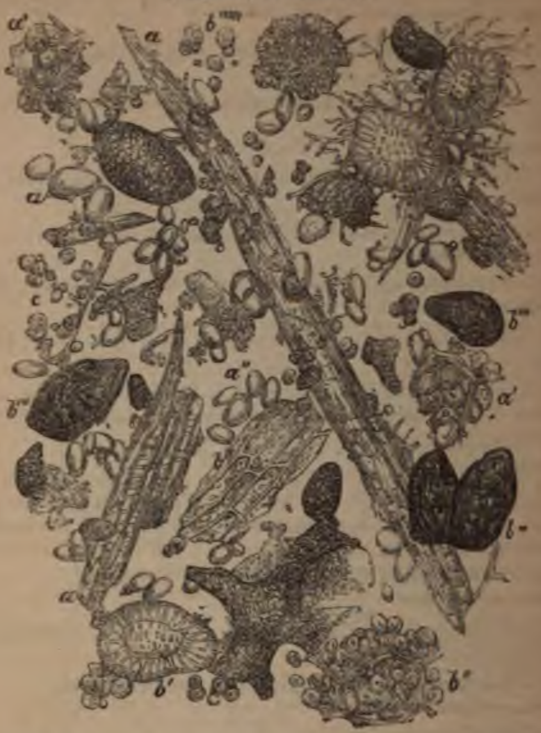
ED SPICE, as the name implies, is a mixture in different proportions of
spices; those of which it is usually composed are ground ginger,
o or allspice, with cassia or cinnamon, and sometimes a small quantity of
ed cloves. Such are the usual ingredients which enter into its composi-
In some rare cases, however, it may contain other spices, as mace or
; but whatever the constituents, and in whatever proportions they are
ed, mixed spice, when genuine, should consist entirely of a combination
es, and should not contain a particle of farinaceous matter other than that
to the articles composing it. Thus it should never contain *wheat-flour*,
farina, or *sago-meal*, and whenever any of these are present, the article
considered and treated as adulterated.

following engraving represents the structure of the several ingredients
h genuine mixed spice is usually formed :—

Fig. 134.

GENUINE MIXED SPICE.

(Magnified 220 diameters.)



a. Woody fibre of ginger. a'. Cells of ginger which contain the starch. a''. Starch granules of ginger. b. Outer husk of pimento or allspice. b'. Stellate cells of same. b''. Husk of the seed proper of ditto. b'''. Port-wine coloured cells of ditto. b''''. Starch cells; and b'''''. Starch granules of same. c. Starch granules and fragments of powdered cinnamon.

RESULTS OF THE MICROSCOPIC EXAMINATION OF TWENTY-SIX SAMPLE
MIXED SPICE,

PURCHASED AT THE ESTABLISHMENTS OF VARIOUS GROCERS AND OILM
THE METROPOLIS.

1st *Sample.*—Purchased of Dannan and Co., Grocers, 2. Walworth-road.
Adulterated.—Containing a large quantity of *sago-meal.*

2nd *Sample.*—Purchased of Field and Co., 9. Walworth-road.
Adulterated.—Containing a considerable quantity of *ground rice.*

3rd *Sample.*—Purchased of Mitchell and Co., Grocers, 17. Blackman- Borough.
Genuine.

4th *Sample.*—Purchased of J. Pringle, Grocer, 35. Blackman-street, Bor
Adulterated with a proportion of *wheat-flour.*

5th *Sample.*—Purchased of S. Jackson, 75. Blackman-street, Borough.
Adulterated.—Containing a *vegetable substance* of a yellowish colour, f of numerous minute angular cells enclosing oil, but not starch; *second vegetable substance* made up of narrow fibres, disposed layers, and crossing each other in a waved manner. These subs

emble very closely the structures of which *linseed* is composed, and
ıbtless belong to some analogous oily seed.
ıple.—Purchased of W. P. Moore, 4. Crown-row, Walworth-road.
erated.—Containing a small quantity of *rice*, and a very large quantity
he first of the two vegetable substances noticed and described under 5th
nple. In this case the substance was remarkable for its decided yellow
our.
ıple.—Purchased of W. Bourne, 109. Blackman-street, Borough.
ine.
ıple.—Purchased of R. Jones, Grocer, 16. Borough.
erated.—Containing the same vegetable substances as were detected in
Sample.
ıple.—Purchased of White and Fairchild, Grocers, 63. High-street,
ough.
ine.
ımple.—Purchased of Russell and Co., Grocers, 72. Borough.
erated.—Containing a considerable quantity of *sago-meal.*
mple.—Purchased of White and Co., Grocers, 107. Borough.
ine.
mple.—Purchased of J. Rose and Co., Grocers, 213. Borough.
ne.
mple.—Purchased of Brocksopp, Sons, and Co., Grocers, 234. High-
et, Borough.
ne.
mple.—Purchased of G. Pike, Oilman, 77. High-street, Borough.
erated—containing a large quantity of *coarsely-powdered sago*, many
icles of which are visible even to the naked eye.
mple.—Purchased of W. T. Brown, 12. High-street, Islington.
rated—contains a large quantity of *wheat-flour.*
mple.—Purchased of Roberts and Arnold, Grocers, 1. Rosomon-
dings, Islington-green.
erated—containing much *wheat-flour.*
mple.—Purchased of G. Budd, Grocer, 86. Goswell-road.
ne.—This sample does not contain *ginger.*
ımple.—Purchased of Burrows and Co., 42. Skinner-street, New-road.
erated—containing a proportion of *potato-flour;* the form of many of
granules is altered, as though the farina had been subjected to heat, in
r to darken its colour.
mple.—Purchased of J. Roberts and Co., 31. Barbican.
rated—containing a large quantity of *sago-meal.*
mple.—Purchased of Stevenson and Co., 159. Whitecross-street.
ne.
ple.—Purchased of W. Turner, 215. Whitecross-street.
rated—containing a large quantity of the vegetable substances noticed
th Sample.
mple.—Purchased of T. Taylor, 89. Whitecross-street.
ne.
mple.—Purchased of S. Hiram, 176. Whitecross-street.
rated—containing *wheat-flour.*
ple.—Purchased of W. Clarke, 216. Whitecross-street.
rated—containing *potato-farina*, the form of many of the granules
g changed by heat.
ple.—Purchased of N. Yarrow, grocer, 42. King-street, Snow-hill.
e.
ple.—Purchased of G. Mills, 35. Little Earl-street, Soho; in tin-foil
age.
rated—containing a large quantity of *wheat-flour.*

appears from the foregoing table, that of the *Twenty-six* samples of
ice subjected to microscopic examination, no less than *sixteen*, or con-
more than one-half, were adulterated; and hence it is seen that of all
, Mixed Spice is the most liable to adulteration.

The present affords an additional instance of what we have so frequently before observed — namely, that the higher the price of any article, the more it becomes subject to adulteration.

It thus again appears that the public and the revenue are extensively defrauded through the adulteration of the majority of the spices sold.

ON PRESERVED PROVISIONS.

The subject of Preserved Provisions is one which possesses at all times much importance, but this has recently become greatly enhanced, in consequence of the late exposures and the doubts thus thrown over the efficiency of the methods hitherto adopted for the preservation of animal and vegetable productions.

We propose, therefore, to enter at some length — first, into the consideration of the nature of the processes employed; and second, to determine to what extent these processes may be relied upon in effecting the object in view.

The following considerations render apparent the immense importance of the subject.

It is notorious that a supply of fresh meat and vegetables is essential, not only to the comfort but even the health of our navy. Until recently this object could only be obtained by taking on board a large quantity of live stock, the maintenance of which at sea for weeks and months was not only very expensive, but the supply thus procured was constantly lamentably short of the demand. The result of this deficiency of fresh provisions frequently displayed itself in the prevalence of scurvy and other disorders, now, happily, nearly eradicated, but which have been computed to have slain more seamen than ever fell in action.

But it is not to our navy only that such a supply is so indispensable; it is equally so to our mercantile marine, and, indeed, in every case where a ship with its crew is destined to pass any length of time upon the ocean; to the adventurous voyager and the gentleman in his yacht it is equally necessary.

Again, a supply of preserved provisions is nearly as necessary to the landsman as the seafarer — to the epicure, the house-keeper, and the invalid.

Through the art by which perishable culinary productions are preserved for lengthened periods, the epicure is enabled to defy seasons and climates; he has only to express the wish, and in the depth of winter he may have at command the productions of summer, and of other and distant countries. Thus, supposing him to be an inhabitant of the East Indies, he may indulge his appetite with the salmon of Scotland, the sardines of France, the truffles of the South of Europe, and a variety of other esteemed delicacies.

In a lecture on the subject of Preserved Provisions, delivered some years since before the Royal Dublin Society, Dr. Meyler thus graphically portrayed some of the chief effects which would result from the adoption of an efficient method of preservation: —

"When the earth is covered with snow, and when vegetation seems extinct, — locked up, as it were, in the icy grasp of death, — our tables may be loaded with the choicest vegetable productions of the spring, of the summer, and of the autumn. When the salmon, the turbot, the mackerel, the lobster, and other dainties of the ocean have become unfit for food, or have left our rivers and our shores, a sufficient supply would remain ready for use in the canisters in which they are cooked, and which will preserve them for us in full flavour. The free denizens of the air and of the forest will be also at our command at all seasons, and at periods when the sportsman could not reach them, or when otherwise they would be unfit for our consumption. Both the animal and vegetable kingdom would thus be at our command in all periods and seasons, to administer to the wants and caprices of the stomach, and to render our kitchens not alone independent of the winds and of the waves, and of the mutations of the seasons, but even of the laws which regulate the economy of organised nature."

By this art the housekeeper may add to his usually limited bill of fare many dainties and indulgences not otherwise attainable.

The invalid also may command at a moment's notice those articles of diet either best suited to his disorder, or such as alone are acceptable to his capricious appetite.

Having thus very briefly dwelt upon the importance of the subject, we will next proceed to consider the nature of the processes employed for the preservation of alimentary substances.

Although in the living organism, both of plants and animals, the chemical force is in operation in a variety of ways, yet its action is so far controlled by the vital force, as to be subservient to health and the maintenance of structure; that when vitality departs the ordinary play of affinities is permitted, and the various elements composing the tissues of the body rearrange themselves into new and simpler forms, giving rise to the phenomena which are known as those of putrefaction, fermentation, decay, and eremacausis.

Now, the object of the different preservative processes adopted is to prevent those chemical changes which occur in dead organic matter, and which constitute decomposition.

The agents which exert a greater or less influence either in retarding or in facilitating decomposition are of two kinds: the first may be termed *natural*, and are temperature, moisture, and air; the second may be denominated *artificial*, as the various preservative substances and fluids employed. We will first refer to the influence of *temperature*.

That heat accelerates, and cold, or a diminished temperature, retards putrefaction, is known to all; but the power of a greatly-reduced temperature in effecting the preservation of dead organic matter may not be so well understood or so generally appreciated.

Although a moderate degree of heat — as, for example, that of summer — facilitates decomposition, yet when the temperature is carried to the boiling-point, heat, as is well known, exerts a contrary effect, and retards putrefaction in all fluids and solids containing albumen; this it does by coagulating and rendering solid that constituent of organic substances, and which, when not thus operated upon, is exceedingly apt to undergo putrefactive changes, and to excite the same in other organic matters with which it is in contact.

The full effect of a diminished temperature or cold in these temperate latitudes we have seldom the opportunity of witnessing; fishmongers, indeed, constantly use ice to preserve their fish, and on all the eastern rivers and coasts of Scotland the salmon is packed in pounded ice, in troughs, and is sent in this state to London, being thus preserved for a long period.

In very cold countries, however, as in Russia, snow and ice are employed on a large scale for the preservation of a variety of animal substances.

"About the end of October, the Russians (according to Dr. King) kill their poultry, and pack them in tubs with layers of snow between them, using them afterwards as occasion requires. Veal frozen at Archangel and brought to Petersburgh is esteemed the finest they have; nor, when properly thawed, can it be distinguished from that which is recently killed, being equally juicy. It is in this manner that the markets are supplied, vast stacks of whole hogs, sheep, and fish being in this state exposed for sale." *

The period during which animal substances, when thus frozen, may be preserved, seems to be indefinite.

"Thus Pallas mentions the fact of a rhinoceros that was found on the banks of a river that falls into the Lena below Jacutsk. The carcase was at first almost entire, and was covered with the hide; and some of the muscles and tendons were actually adhering to the head when Pallas removed it. The preservation of this natural mummy, says Professor Playfair, was no doubt brought about by its being buried in earth that was in a state of perpetual congelation, for the place is in the parallel of 64°, where the ground is never thawed but to a very small depth below the surface.

"A still more remarkable discovery of this kind was made in 1799, on the shores of the Frozen Sea, near the mouth of the same river Lena, which is one of the largest in Siberia. An animal of uncommon size was found imbedded in a mass of ice, which, as it melted, gradually disclosed him to view; his hair, skin, and flesh were in good preservation, so that dogs and many wild animals preyed upon it. The block of ice in which he was found was upwards of 200 feet high; and when first discovered, he appears to have been about forty feet beneath its surface. According to the celebrated Cuvier, this animal differs from every species of elephant, as well as from the large animals whose bones have been found on the banks of some of the great rivers in America. He bears, indeed, no resemblance to any species of animal at present known on the surface of the earth; and is therefore considered by Cuvier as *antediluvian*, and to have been preserved from the remote period of the deluge in the mass of ice that enveloped him."

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* Observations on the Preservation of Animal and Vegetable Food, page 6.

It appears that vegetable substances may likewise be preserved for lengthened periods in the frozen state, and, provided they be properly thawed, without injury to their qualities.

Great care, however, is necessary in the thawing of all frozen substances, whether animal or vegetable; this should be effected very slowy, and the best means is by immersion in cold water.

A freezing temperature acts in the preservation of organised substances, by reducing the water by which they are permeated in every direction, and which is so essential to chemical action, to the solid state, a condition in which such action is rendered impossible.

Now water or moisture may be not merely frozen in, but entirely removed from organic bodies.

Thus it may be removed by means of currents of dry air; the marked effects of which are witnessed in sandy deserts, where but little rain falls, and where the winds which frequently prevail, being exceedingly dry, readily abstract moisture from any dead organic substance with which they happen to come in contact.

"I have been credibly informed," writes Dr. Shaw, "that at Saibah, which lieth about the half-way between Ras Sem and Egypt, there are a number of men, asses, and camels, which have been preserved from time immemorial in this manner. They are supposed to have belonged to some caravan or other, which in passing over these sandy deserts was suffocated by the hot, burning winds that now and then infest these sandy countries."

But organic substances may also be very completely deprived of moisture by means of heat alone, or by this in conjunction with free exposure to air.

Indeed, this means of preservation has long been resorted to in the case of grapes, which are preserved in the forms of raisins and currants; of plums, in that of prunes; and of apples, as Normandy pippins; in the animal kingdom we have dried gelatine and various kinds of dried fish, the preservation of which, however, is not entirely due to the drying from simple exposure, but in part to the salt used, to the mode of operation of which substance we shall hereafter have occasion to refer.

In the little work from which we have already quoted*, the following observations occur relating to the preservation of vegetables by the abstraction of their water: —

"Some vegetables, however, as potatoes and turnips, may be preserved a long time without change, though containing a large portion of water; but could they be deprived of this water, their preservation would be more easily and certainly accomplished, and their transportation greatly facilitated. A process for effecting this purpose was proposed some years ago by Mr. Forsyth, advocate. It consisted in first cutting or breaking the potatoes into small pieces, and then dissipating their water by exposing them on a metallic plate, heated by the steam of boiling water; in this manner they may be rendered dry without risk of scorching or burning; and the flour or meal they yield is said to have no disposition to attract moisture, and if closely packed may be preserved for any length of time. This process seems to be simple and efficacious, and might be advantageously used for the desiccation of any other vegetable sub-nces; but it is probable that the labour and expense attending it will prevent employment to any great extent in ordinary life. It seems, however, worthy attention of mariners, who may desire to possess vegetable substances in a te adapted to keep through long voyages."

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* Loc. cit., pages 6, 7.

The process proposed by Mr. Forsyth appears recently to have been put into cution with very considerable success under the patent of M. Masson, Head rdener to the Horticultural Society of Paris. This gentleman has succeeded preserving in a very perfect manner various descriptions of vegetables and its: the substances thus preserved are dry and shrivelled, contain but little er, and it is evident from their appearance that a very essential part of the cess of preservation consists in the abstraction of the water, which forms so y considerable a portion of the weight and bulk of nearly all vegetables and ts. When vegetables thus prepared are immersed in water for some time, y swell up, become soft and tender, and resume to a very great extent the earance, colour, and flavour proper to them in the fresh state. M. Masson managed to preserve completely, spinach, Brussels sprouts, cabbage, beans, s, sliced carrots, parsnips, potatoes, apples, &c. Having ourselves submitted ples of each of these fruits and vegetables to examination, we are in a tion to speak from personal knowledge and observation, and are enabled to e that the results obtained apparently in so simple a manner are really prising.

t is obvious that the importance to navies of these dried vegetables is very at; and from the following extract of a Report, it appears that the naval horities of France are not only well satisfied with the success of the process, also fully alive to its advantages.

Extract of Report from the Committee appointed by the Minister of Marine, respecting the advantages of M. Masson's *Dried and Compressed Vegetables, for the use of the French Navy.*

"Paris, 24th November, 1851.

"By a resolution of the 27th August last, the Minister of Marine appointed committee to examine whether it would be advantageous to the navy to adopt e use of M. Masson's dried and compressed vegetables, and the result fully nfirmed the favourable reports unanimously made to the Minister of Marine, m the five military ports where the experiments were tried.

"The experiments were made with cabbage, potatoes, julienne, French beans, ricots, Brussels sprouts, spinach, endive, cauliflower, bulb-rooted celery, ples, chervil, parsley, and taragon.

"The good state, appearance, and flavour of the different vegetables, have n unanimously approved; consequently, there is no doubt that the useful ention of M. Masson will be a benefit to the navy.

"Cabbage, which has been four years on board a man-of-war, was tested by committee, with the most complete success.

"The committee entirely agree with the opinion of one of its members, that enne is a vegetable most suitable for the sick.

"Trials were made, at various times, to ascertain by comparison the difence between the preserved ready-dressed julienne, in tin boxes, and the ples presented by Mons. Chollet, which last met with the decided preference he committee, on account of its superiority, and, above all, its cost being one-third that of the preserved ready-dressed julienne in tin boxes, as it is supplied to the navy.

"The committee has also made experiments with Mons. Chellet's vegetables, scertain whether they are suited to the hospitals of the colonies — Senegal, instance — where they are absolutely without vegetables for nine months he year, and the committee is of opinion that in such case they would be he greatest advantage.

The committee proposes to order immediately the necessary quantity of age and julienne to provision

1st. For one month, *six ships of the line.*
2nd. For six months, *the frigate in command of the West African station.*
3rd. For six months, *the flag-ship stationed in the China Seas.*
4th. For one year, *the "Armida" transport frigate.*

"The cabbage should be given three times a week with the salt meat, in proportion of fifteen grammes to each man.

(Signed) JURIEN,
The Director of the Administrative Ser

"Paris, 10th December, 1851."

At the late Great Exhibition, the invention of M. Masson, if it may termed such, was rewarded by a Council Medal.

It is stated that a cubic yard of these dried and compressed vegetables cont as much as 16,000 rations; and that they are of better flavour, and m cheaper, than the vegetables preserved in the moist way in canisters.

We have been given to understand that the attention of our own n authorities has been directed recently to the vegetables prepared under patent of M. Masson, and that a supply of them has been ordered for our na

But by far the most certain and manageable of the natural means of insur the preservation of animal substances, is by excluding the *atmosphere*.

Thus eggs, the shells of which have been covered over with a coatin varnish or grease, whereby the air is prevented from passing through the p of the shell, and so promoting decomposition, have been preserved in a perfe fresh state for several years, and so as to be capable, when set upon, of p ducing chickens. Again, instances have repeatedly occurred in which to serpents, and other animals have been found, in perfect preservation, immu in the hearts of trees or in the solid rock.

Few attempts appear, however, to have been made to preserve veget substances by the simple exclusion of the atmosphere; it has been sugge that many fruits might be kept for a long time, as oranges, lemons, app pears, &c., by coating them over with a layer of varnish in the same manne the shell of the egg.

Currants, gooseberries, cherries, and other soft fruits, have been preser for use in winter by gathering them when not too ripe, and, when very putting them unbruised into dry bottles, which are afterwards well corked, then buried in the earth. This method acts partly by the exclusion of the and partly by the low and uniform temperature which prevails beneath the face of the earth.

The efficiency of this method of preservation is increased by immersing bottles containing the fruit, for a few minutes, and previous to corking, in water. By this proceeding the vegetable albumen, which is so prone to into a state of decomposition, is solidified, and rendered less disposed to und putrefactive changes.

A further improvement on this method was suggested so far back as the 1807 by Mr. Saddington, who received from the Society of Arts a premium "A Method of Preserving Fruits without Sugar for House or Sea Stores."

The fruit is to be gathered before it is too ripe; the bottles are to be filled with it, and loosely corked; they are next to be placed in a vessel cont ing cold water, which should reach as high as the necks of the bottles; hea then to be applied, and the temperature raised to from 160° to 170°, and m tained at this for half an hour; but the heat must not be raised higher continued longer, as the fruit would be liable to burst. Lastly, the bottle to be filled to within an inch of the corks with boiling water; they are to be corked immediately, and laid upon their sides, so that the water may swel corks, whereby the entrance of the air will be more effectually prevented.

We have next to inquire, upon what principle does the exclusion of th assist in the preservation of organic matter? The atmosphere is a mi of oxygen and nitrogen in certain proportions; the former of these has a affinity for the elements of organised bodies, and so it is ever striving to bine with them and effect new combinations. It thus facilitates chemical cha and consequently promotes decay. By excluding the atmosphere, we, there shut out a powerful agent of decomposition.

It has been suggested, that in place of driving the air out of the vessel then taking means to preserve a vacuum, it might be desirable in some to surround the substance with an artificial atmosphere, not containing ox as of nitrogen or hydrogen gases.

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* The agents in London are C. Devaux and Co., 62. King William-street, City.

Ve now come to the consideration of an important division of our subject— , the means employed by the manufacturers of preserved foods of different ds to insure their preservation.

he following is a brief and general description of the method of preservation commonly practised :—

he article to be preserved is placed, sometimes in the raw state, but generally ked, in a tin canister, the lid of which is soldered down, but is perforated a small aperture or pin-hole. It is then subjected to the action of either m, boiling water, or a muriate-of-lime bath, until the contents of the canister, ot previously dressed, have become about two-thirds cooked. The aperture e cover is then closed, and the canister and its contents are once more sub-ed, for a shorter period, —that is, until the article is completely dressed— e operation of heat. As soon as it has become cold the canister is covered with a coating of paint ; its preparation is then complete, and it is removed e proving room. The proving room is simply an apartment the temperature hich has been raised to the degree most favourable to decomposition. If the ation of preservation has been well performed, the top and bottom of the ster, as also, in some cases, the sides, will have fallen in, or have collapsed ome extent ; this indicates the exhaustion of the air within, and is regarded he manufacturer as a tolerably correct proof that the process has been pro-y conducted. If, however, after some days' exposure in the proving room, top and bottom of the canister first become flat, and subsequently even vex, it is a certain sign that the contents have not been well cured, and that y are not in a condition to keep for any length of time. Such canisters have refore to be either rejected, or else subjected to the same process over again.

On a consideration of the above details, it appears that the preservation of icles cured in this manner is due to two causes—viz., first to the coagulation, the heat employed, of the albumen, which, we have stated, is so prone to omposition ; and second, to the expulsion of the air by the formation of am. The subjection of the canister to the action of heat a second time, d after the aperture has been closed, might appear at first sight to be un-cessary ;—it is not so, however, as it is required to expel the last portions of in the case, and which escape through the pores present in the tin. As even er the second application of heat, air would in time enter the canister by these es, it is found advisable that each should receive a thick coat of paint.

The operation of closing the pin-hole is one of considerable nicety ; the heat ployed drives out not only the air contained in the canister, but also a jet of m, and this with considerable force. The solderer, therefore, squeezes a few ps of cold water from a sponge, and allowing these to fall on the tin, around aperture, produces a momentary condensation and arrest of the steam, ing which the pin hole is dexterously closed. The nicety of the operation sists in carrying the condensation only so far as barely to arrest the jet steam, and in closing the aperture at the instant. If carried too far, or if soldering be delayed, the air re-enters and endangers the success of the cess.

visit to the establishment of a manufacturer of preserved provisions will repay the curiosity of the inquirer. If well regulated it should consist of eral compartments, a butcher's shop, kitchen, proving-room, store-house, canister factory.

should be known that it is not only *boiled* provisions which may be preserved he above process, but *roasted* also, with but a little extra care.

he application of heat for the preservation of animal and vegetable substances, s to effect at the same time the coagulation of the albumen and the exclusion e atmosphere, was first put into general practice on a large scale by M. Appert. This practice originated at the period of the French Revolution, when, from destruction of commerce in consequence of the long wars that prevailed, want of a process of preserving perishable alimentary substances was very h felt—a want which caused the nation, in 1809, to offer a reward of 00 francs for the discovery of this great desideratum. This reward was owed, in 1810, on M. Appert, for his inventions.

The process of M. Appert differed in some respects from that employed in the ent day, many improvements having been effected since his time.

One great difference was, that M. Appert made use only of glass vessels, disadvantages of which were, their liability to burst, and the extreme dif experienced in completely excluding the air.

In order to preserve boiled meat, M. Appert adopted the following pro ings:—The bones were first removed from the meat; this was boiled ordinary way until it was about three-fourths done. It was then taken out, put into jars, which were completely filled with strong broth made from portions of the meat. The jars were then corked, coated with cheese and dered lime, put into bags in order that the fragments might be caught, any of the jars burst, and placed in a boiler of cold water. Heat was applied until the water boiled, and the boiling temperature was maintained about an hour, when the fire was extinguished, the water drawn off, and the gradually cooled.

Soups, gravies, broths, and the juices of fruits, were preserved in the manner; but with these the boiling should be continued for an hour longer.

To preserve milk, M. Appert evaporated it in a water-bath to about one removing from time to time the albuminous scum which rose to its surface; milk was strained, allowed to cool, and after having been secured in the was again submitted to the action of the water-bath for two hours. Milk pared in this way kept fresh for two years; after which, the butter or separated from it. This separation was subsequently prevented by the ad to the evaporated milk of a small portion of yolk of egg, which succeeded fectly. Cream was evaporated to the extent of one-fifth, and afterwards served in the same manner.

Peas, Windsor beans, either with or without their skins, were packed bottles in the raw state, and afterwards subjected to the action of the water for from an hour and a half to two hours.

Carrots, potatoes, turnips, require to be half dressed before being put in bottles.

Fruits and their juices should be put up as soon as possible after gath they should be gathered when not too ripe, lest they should suffer in the pa and as they would be apt to dissolve from the action of heat.

In the preservation of white and red currants, cherries, raspberries, and small fruits, the water is just allowed to boil only; the fire is then extingu and the bottles permitted to remain in the water for a quarter of an hour when it is drawn off.

The larger soft fruits, as apricots and peaches, are first to be stoned, an into pieces, in order that they may pack closer in the bottles.

The expressed juices of fruits must be strained before being bottled.

When required for use, nothing more is necessary, in the case of all articles which, previous to being placed in the jars or bottles, have u gone either partial or complete dressing, than that they should be warmed.

For the above details respecting the process of M. Appert we are indebt the little work before quoted.

In addition to the articles above referred to, a great variety of dainties luxuries are now preserved on the principles of M. Appert, modified and further improved; to some of these articles we shall have occasion to refer after.

We have now to consider very briefly the *modus operandi* of those preserv substances which, in contra-distinction to the natural, may be termed *artif*

The chief articles employed for the preservation of organised substance salt, sugar, oil, charcoal, acetic acid, or pyroligneous acid, and alcohol.

Salt is used in the curing of fish of different kinds, bacon, hams, &c., pickling of pork, and in the corning of beef. It possesses great affinit water, which it abstracts largely from the substance to which it is applied, which affinity its power as a preservative agent is mainly due. Its effect stracting water from meat is well seen, in the pickling of pork, in the large a of fluid termed brine, which escapes from the meat.

Unfortunately, the effect of salt in its application to the preservation of is not confined to the removal of water; it hardens the fibre so as to ren tough and indigestible; and at the same time the water, the discharge of it occasions, dissolves out of the meat several of its most important constit the albumen, kreatine, kreatinine, lactic acid, and soluble phosphates: again, s salted meat, by the subsequent boiling to which it is subjected, has its ritive properties still further impaired, for this extracts much of the gelatine osmazome; thus at length little else of the meat is left besides the fibre, ch is so insoluble and comparatively destitute of nourishment.

fter this explanation of the operation of salt on meat, the reason why the tinued use of salted provisions for any length of time gives rise to scurvy and er disorders is evident.

he following important remarks, taken from Liebig's "Researches on the mistry of Food," will be read with interest: —

" It is obvious that if flesh employed as food is again to become flesh in the y,—if it is to retain the power of reproducing itself in its original condition, one of the constituents of raw flesh ought to be withdrawn from it during its paration for food. If its composition be altered in any way,—if one of the stituents which belong essentially to its constitution be removed,—a corrending variation must take place in the power of that piece of flesh to re-assume he living body the original form and quality on which its properties in the ing organism depend. It follows from this, that boiled flesh, when eaten *thout* the soup formed in boiling it, is so much the *less* adapted for nutrition greater the quantity of the water in which it has been boiled, and the longer duration of the boiling."

Salt exerts the same effect on vegetable substances as on animal; this is seen its application to sliced cucumbers and other vegetables. Salt-and-water, med "brine," is largely employed by pickle-makers for keeping a reserved ck ready for use at all times and in all seasons, of the different kinds of vegebles used by them for pickling. The larger makers have some hundreds of gsheads filled with various vegetables — in some, beans, in others, gerkins, d so on —thus preserved in salt-and-water. We have been given to underand that they keep well for months in this way. The salt-and-water is selected preference to vinegar on the score of economy.

Sugar is principally employed for preserving fruits, either entire or in the te of jam or marmalade. In the condition of syrup it is semi-solid, and erates partly by the barrier which it interposes to the free access of the mosphere to the surface of the fruit, and partly in consequence of its being a n-nitrogenous substance.

The use of *oil* as a preservative medium is extremely limited; sardines and chovies are nearly the only articles commonly put up in oil. It appears to erate in the same manner as sugar.

The powerful effect of *charcoal* in retarding putrescence in meat, and even in toring tainted meat to a state of sweetness, is well known. Its action is due its property of absorbing gases, and effecting their oxydation as rapidly as they developed from the decomposing meat, and which is thus made to preserve at st the appearance of freshness.

he use of dilute *acetic acid* or *vinegar* is confined to the preservation of etable substances, and is employed principally by pickle-makers. We are aware that its mode of operation is well understood; it probably acts chiefly the coagulation of the vegetable albumen which it occasions.

yroligneous acid, which is an impure kind of acetic acid, possessing a smoky our, is applied in two ways to the preservation and curing of such articles as ns and red herrings, either in the fluid state, or in that of vapour; in the latter it proceeds from the wood or turf employed in the drying, and which, being tinually formed and evolved during the imperfect combustion of the wood turf, gradually penetrates into every part of the meat, imparting the flavour ich is so much esteemed. Its action is, no doubt, the same as that of acetic id.

Alcohol is but little used in the preservation of alimentary substances, hough some fruits, as cherries, are often preserved in brandy. For the servation of anatomical preparations it is the best liquid known. Its action in part due to its affinity for water.

It now only remains to ascertain how far certain of the processes of preservan above described do really accomplish the object in view.

[illegible] NUMEROUS SA
[illegible] AND ANIMAL.

PRESERVED VEGETABLE SUBSTANCES.

PRESERVED VEGETABLES.

In Canisters.

[illegible] — Purchased of [illegible] & [illegible], Houndsditch, one
[illegible]

Examination. — [illegible] the slices of turnip were of a de [illegible] possessing nearly unimpaired the [illegible]

[illegible] — Purchased of [illegible], Cheapside, one pound ca
[illegible]

Examination. — On opening the canister the contents were found to [illegible] colour and taste.

[illegible] — Purchased of [illegible] & [illegible], Leadenhall-street, on
[illegible]

Examination. — In this case the peas were found to have lost much [illegible] colour: at the sam [illegible] was perceptible; they were p [illegible] therefore, to say t [illegible] successful.

4th Sample. — [illegible] — Purchased of Westbrooke & Co., 21, Oxford
[illegible]

Examination. — [illegible] short pieces, presen [illegible] vegetable, and their state of p [illegible] good.

In Tinfoil Packages.

[illegible] Sample. — Cabbage, preserved according to the process of M. Masso

Examination. — On opening the package, the contents, which formed [illegible] were seen to consist of fragments of leaves of a yellowish col interspersed here and there with some that were green. In this state difficult to determine what the nature of the vegetable was. Soake water for about half an hour, it gradually underwent a great expan that it occupied several times its former bulk. When examined, evident at a moment's glance that the vegetable consisted of th leaves of the white-hearted garden cabbage, the leaves present appearance and colour, and possessing the taste and smell to a rem extent of the vegetable when in its recent state.

6th Sample. — ***Brussels Sprouts,*** preserved according to M. Masson's pr

Examination. — On removing the tinfoil, the contents of the package dried state were seen to be of a deep green colour, and to break separate masses, on the surface of many of which a perfect leaf co quently be traced. On immersion in hot water for half an hour, th table, as in the previous case, increased greatly in size, and it w evident that it consisted of Brussels sprouts, the fresh and natural ance presented by which was really marvellous.

7th Sample. — ***Julienne,*** preserved according to the process of M. Masso

Examination. — The contents of this package presented, in the dried variegated appearance, and consisted evidently of fragments of veg some green or red, and others of a yellowish colour; soaked in h for the same length of time as in the other cases, they increased to times their original size, and the following vegetables sliced int pieces, but in perfect preservation, could be readily detected — viz., carrot, and cabbage.

These mixed vegetables are intended to be used in the preparation of " Soup."

8th Sample. — ***Potatoes,*** preserved according to the process of M. Mass

Examination.—The potatoes were reduced to thin slices, which were about as thick as a shilling, twisted or curled, and somewhat transparent; on immersion in hot water, the slices increased greatly in size, became opaque, and presented the appearance of the potato in its recent and raw state.

9th Sample.—*Carrots*, preserved according to the process of M. Masson.

Examination.—This vegetable, also in slices, when soaked in hot water, recovered most completely its natural appearances and qualities.

The packages in which the different kinds of vegetables prepared under the patent of M. Masson are enclosed are about four inches square, and five-eighths of an inch thick. Each package bears the name of the vegetable contained in it, is furnished with directions for dressing, and specifies the number of rations which it will afford.

It is evident from the appearance of these vegetables that they have not only been thoroughly dried, but subjected also to very great pressure.

10th Sample.—*Potatoes*, preserved under the patent of Mr. Edwards.

Examination.—These potatoes are in the form of little granular fragments, very closely resembling tapioca; one would judge from their appearance that the article consisted of cooked and mashed potatoes, well dried and broken into small pieces. Treated according to the directions printed below, we obtained an excellent dish of mashed potatoes.

"By Royal Letters Patent.

EDWARDS' PRESERVED POTATO.

Proved to keep in all climates, and not occupying one-sixth the space of other Potatoes.

DIRECTIONS FOR USE.

"To about *Three Quarters of a Pound* of the Patent Preserved Potato, add One Quart of *Boiling Water*, stirring it at the same time; cover it closely, and to prevent chilling, the basin or vessel used should be kept hot; let it stand for ten minutes, then *Well Mash*, adding salt, butter, &c., at pleasure.

"Observe.—The Cooking of this concentrated Vegetable is effected by the above simple means, and a Dish of Mashed Potatoes, excellent in flavour, and highly nutritious, is produced at a cost not exceeding the Common Potato.

"N.B.—The Patent Preserved Potato is proved of great advantage in making Bread, Pastry, Soups, &c.; if flour be mixed with it, and well boiled in a cloth, it produces (without Suet or Eggs) a light and wholesome pudding.

D. & H. EDWARDS & Co., Sole Patentees, No. 1. Bishopsgate-street Within, London."

The excellence of Edwards' preserved potatoes are certified to by Professors Brande, Daniell, and A. Taylor, Dr. Paris, and Dr. Ure, and they have formed the subject of several favourable reports, made at the instigation of the army and navy authorities, one of which we republish.

"*Special Report on the Patent Preserved Potato, required by Dr. Gordon's Letter, May 20. 1842, for the Army Medical Department.*

"The Preserved Potato, of Edwards & Co., was this day treated according to the printed directions contained in each bag, and was then tasted by each of the undersigned, as well as by many other persons, (Medical Officers and patients in the hospitals,) and all were of opinion, that the preparation, as far as they could discover, retained all the virtues of fresh potatoes, and was not less palatable.

"The Board therefore consider the preparation as affording a most valuable article of diet, and are of opinion that it might be advantageously adopted as a portion of the ration of Soldiers proceeding on board ship to foreign stations.

"In the event of its not being considered necessary by the Authorities to adopt it generally, they would particularly recommend that a quantity of it should be regularly put on board ships conveying troops, in order to be issued to such sick as the Medical Officers in charge might consider it better adapted than the articles of diet which it has hitherto been customary to substitute for salt provisions.

(Signed)
Andrew Smith, M.D., P.M.O.
J. Kinnis, M.D., Staff Surgeon.
R. Dowse, Staff Surgeon, 2nd Cl.

" General Hospital, Fort Pitt, 5th June, 1842."

The certificate given by Dr. Ure is as follows: —

" I hereby certify that Messrs. Edwards' Patent Preserved Potato contains, by chemical analysis, the whole nutritious principle of that root in a pure concentrated state; that it contains
60 parts in the hundred, at least, of starch; nearly
30 of a soluble fibrine of demulcent antiscorbutic quality;
5 of a vegetable albumine of the nature somewhat of the white of egg; and
5 of a lubricating gum.

" The fibrine and albumine render it more light of digestion, and the gum more demulcent to the stomach than wheat-flour, with which, also, it may be regarded as nearly equally nutritious, and more so than peas, beans, sago, or arrow-root.

Andrew Ure, M.D., F.R.S."

On the very peculiar style of the above document, as well as on some of the very questionable statements contained in it, we refrain from offering any comment.

Edwards' Patent Preserved Potatoes were used in the Arctic Expedition in search of Sir John Franklin, under Captains Austin and Sir John Ross, and gave great satisfaction, as appears from the annexed testimonial: —

" *Her Majesty's Ships Resolute and Assistance, Pioneer and Intrepid, Steam-Tenders, in Search of Sir John Franklin, &c.,* 1850 *and* 1851.

" We the Commanders and Officers employed in the Arctic Expedition under Captain Horatio Thomas Austin, C.B., feel bound to record our favourable testimony of the excellent properties of Edwards' Patent Preserved Potato. In fact, we can scarcely speak too highly of it as a vegetable: being able to use it in various ways, it retained all the virtue, and much of the flavour of fresh mashed potato, during the whole voyage out and home, a period of eighteen months; and that remaining is as good and serviceable as ever. The men having been perfectly free from scurvy, we are induced to entertain a high opinion of its antiscorbutic properties. The whole of the people appeared to relish the Preserved Potato more with their salt meat than with anything else, and infinitely to prefer it to *rice*, or the mixed vegetable or carrots, with which these ships were supplied.

Signed by the Officers and Surgeons of H.M.S.
Resolute, Assistance, Pioneer, Intrepid."

Preserved in Gravy; in Tin Canister.

11th Sample. — Purchased of J. H. Gamble, 137. Leadenhall-street, one pint canister of *vegetables and gravy*, price 10*d*.

Examination. — This article consists of beef-soup, containing a considerable quantity of sliced carrot and turnip. It constitutes a very agreeable article of diet, suitable for luncheon or supper. The contents of the canister opened by us were in a perfect state of preservation, and free from the slightest taint.

PRESERVED FRUITS.

In Bottle.

12th Sample. — Purchased of Crosse & Blackwell, 21. Soho-square, bottle of *cherries*, price 1*s*. 3*d*.

Examination. — The fruit had evidently been dressed, and consequently lost its form somewhat, as well as much of its colour, which had passed into the fluid in which the cherries were immersed, and which consisted of water only. The fruit itself retained much of its original flavour, but the water surrounding it possessed the flavour still more strongly.

In this and the three following cases the process of preservation adopted was the one which originated, many years since, with Mr. Sadlington. In this instance the result may be said to have been most satisfactory, the fruit being in excellent condition for use in tarts.

13th Sample. — Purchased of Crosse & Blackwell, 21. Soho-square, one quart bottle of *raspberries and red-currants*, price 1*s.* 9*d.*

Examination. — Fruit slightly altered in appearance only, from the action of the boiling water to which it had been subjected, but presenting very much the colour and taste proper to the fruit in its fresh state, and in good condition for pies and tarts.

14th Sample. — Purchased of Westbrooke & Co., 21. Oxford-street, one quart bottle of *gooseberries*, price 9*d.*

Examination. — The gooseberries had lost much of their green colour, but retained their form well, and were all entire. The taste was that of the fresh fruit, but less acid than freshly gathered gooseberries usually are.

15th Sample.—One quart bottle of *greengages*, manufactured by Bull and Ambler, price 1s.

Examination. — Fruit somewhat faded in colour and wrinkled, but possessing to a great extent the flavour of greengages when not quite ripe; the fluid in which the greengages were immersed was very acid, and covered with a thick coating of fungus.

In Tinfoil Packages.

16th Sample.— Apples, preserved according to the process of M. Masson.

Examination.—Fruit cut into slices, which in the dried state were about the thickness of a shilling, but become, when immersed in water for a short time, greatly increased in dimensions, and then resemble in a very perfect manner the appearance and taste of the recently-sliced fruit. Altogether, the preservation in this case was the most complete and satisfactory yet noticed.

PRESERVED ANIMAL SUBSTANCES.

17th Sample.— Purchased at the office of the agency, No. 2. St. Peter's-alley, Cornhill, one pound of

"BORDEN'S PATENT MEAT BISCUIT,
Manufactured at Galveston, United States, by
Gail Borden, Jun.
JURY III.—THE COUNCIL MEDAL AWARDED.
Exhibition of the Industry of All Nations, 1851.

"This new and useful preparation of concentrated meat and bread can be prepared for use in the shortest time as a soup. Puddings, custards, sauces, &c. are made from it in the United States. One pound of this meat biscuit contains the nutriment of five pounds of the best beef, the extract of which is combined and baked with the finest flour, forming the most portable and convenient diet known. It is eminently adapted for the naval and commercial marine, whalers, and troops on frontier service; for emigrants, travellers, and for ordinary use in families, &c. Its easy digestibility and highly-nutritious properties render it very valuable for invalids and convalescents, and generally for use in hospitals. Its preservative qualities have been fully tested by its being carried to California across the Plains, and from New York to Canton and back, and other long voyages.

"No article purporting to be the meat biscuit will be guaranteed as genuine, except purchased of the patentee's authorized agents.

DIRECTIONS FOR COOKING.

"The biscuit being ground or made fine, stir it into sufficient cold water to form a thin batter; let it remain in this state a few minutes, then pour it into boiling water, and boil it twenty to thirty minutes, stirring frequently during the process, to prevent burning.

"Add salt and pepper to suit the taste.

"Such condiments may also be added as are used in other soups; but if vegetables, they must be previously cooked. Without vegetables, a little milk may be added when boiling. This biscuit put into the liquid of well-boiled vegetables strained through a colander, will make an excellent soup.

"One ounce, or a little less than two tablespoonfuls of this biscuit, will make a pint of very rich, nutritious soup. After boiling, if found too thick, dilute with boiling water; or if diluted with cold water, let it boil again.

"In case of shipwreck or other emergency, the biscuit may be eaten without preparation.

"The *whole* biscuit can be ground in a common spice or pepper mill, made fine in a mortar, or crushed under the rolling-pin.

Price 2*s*. 6*d*. per pound.

WHOLESALE ORDERS EXECUTED.

Sample packages of one pound or more, whole or ground, the latter more convenient for immediate use."

Examination.— The biscuits are usually reduced to a coarse powder, and in this state are packed in tin canisters. The powder is of a brownish colour, has evidently been subjected to the action of heat, and has the taste and smell, to a considerable extent, of roasted beef. Prepared in the manner directed, it affords an article of diet of very agreeable flavour; and, if the statement made respecting it — viz., that one pound contains the virtues of five pounds of beef — be correct, an article possessing highly nutritive properties.

In reference to this preparation, it appears that the nutritive qualities of the meat are extracted by means of heat; whether the process is so conducted as to ensure the removal of the whole of the albumen, we cannot say. From amongst other testimony adduced in favour of "Borden's Meat Biscuit" we extract the following: —

(COPY.)

From Col. E. V. Sumner, 1st Regiment U. S. Dragoons.

"Fort Leavenworth, May 14, 1850.

"MAJOR,— I have tried the 'Meat Biscuit,' and find it all, and more than the inventor thinks it is. To satisfy myself, I have lived upon it *entirely* for several successive days, and I am convinced that I could live upon it for months, and retain my health and strength. I thought that, although it might sustain life, there would be a craving for more solid food; but it is not so — my appetite was perfectly satisfied. The inventor thinks that five ounces a day will support a man. * * * I could not use four ounces a day, made into soup, with nothing added but pepper and salt; and, moreover, I found I could entirely dispense with tea and coffee, which is a great advantage, and which has not been enumerated.

"In my judgment, this is a very great discovery, and must lead to important results.

"I have long thought the compression of wholesome food into a smaller compass was one of the most important things that remained to be discovered in this age of inventions. Think of a regiment of 500 men, cutting loose from all magazines for two months, with no other baggage-train than 50 or 60 packed mules. At five ounces a day for each man, the weight would be 9375 pounds, which forty-five mules would carry.

"In military operations fresh meat would generally be found and put into the soup, which would make it more substantial; but the men could subsist without it, and it would not be necessary for their health and vigour to transport *bread* or any other rations.

"I have no idea that it will be used to this extent for some time to come, as great changes must be gradually made; but I am decidedly of opinion, that we ought to commence using it in the army at once; and I believe, *for all active operations in the field*, the advantages of this food will be so apparent, that it *will* come into general use in a few years.

"I think it will be better to have it always pulverized, and kept in tin canisters to hold about 25 pounds.

"The inventor had better send me a dozen of these canisters before I march upon the plains this summer.

"I shall frequently send out detachments on long excursions, and it will be a good opportunity to put this discovery to a thorough test. Please send this letter to Gen. Gibson—and will you inform Mr. Borden of its purport?

"Very respectfully, your obedient servant,
E. V. SUMNER,
Brevet-Col. 1st Dragoons."

"To A. B. Eaton, Com. Sub. U. S. Army."

(EXTRACT.)

From J. J. B. Wright, M. D., &c., Chief Surgeon of the 8th Military Department.

"I have examined and tried the article (the meat biscuit) with considerable attention to particularity—have used it in the hospital and at our private table; and have no hesitation in bearing testimony to its excellence as an article of diet. I think it admirably adapted for the use of troops on long marches or campaigns, where it is important to combine a large quantity of nourishment in small bulk and little weight.

"A friend of mine has in his possession a remaining quantity of the article, that was manufactured a year ago last September; which, having been kept with only ordinary attention to its preservation, is now in as good condition apparently, as when it was first prepared.

(Signed) "J. J. B. WRIGHT,
Surgeon U. S. Army."

"January 4, 1851.

"To Brig.-Gen. Thos. Lawson,
Surgeon-General of the Army."

18*th Sample.*—*Extract of beef*, preserved according to the process of Mr. Roberton, of Manchester.

Examination.—This article is in the state of fine powder of a light brown colour; it possesses all the taste and smell of freshly roasted beef; half a pint of boiling water poured upon two tea-spoonfuls of it furnishes in the course of two or three minutes, a large cup of beef-tea of excellent quality.

It will be remembered that, some short time since, we spoke in favourable terms of this really important preparation. It is prepared under a process which has been patented by Mr. Roberton, of Manchester, for the manufacture of pharmaceutical extracts generally, and by which a very high degree of concentration is obtained, in most cases without heat. It is estimated that one ounce of the dried extract of beef contains the whole of the nutritive properties of one pound of solid meat. In using it, it may be combined with flour or vegetables.

19*th Sample.*—Purchased of J. H. Gamble, 137. Leadenhall-street, half-a-pint canister of *preserved milk*, price 6*d*.

Examination.—On pouring out the contents of the canister, it was seen that a separation of the butter had taken place to a great extent; the milk also possessed a flavour which, although it could not be said to be the result of decomposition, was yet not agreeable, and was perceptible in the tea to which the milk had been added.

The process of preservation in this case can hardly be considered successful; it was evident, however, that the milk was rich in cream, of excellent quality, and certainly very different from the blue watery compound sold as milk in London.

It will be remembered that the separation of the cream from the milk was noticed to occur under the process adopted by M. Appert, but that gentlemen succeeded in preventing it by the addition of a small quantity of the yolk of egg.

SOUPS AND BROTHS.

20*th Sample.*—Purchased of D. Hogarth & Co., Aberdeen, and 78. Cheapside, half-pint canister of pure *essence of beef*, price 6*d*.

"Add one pint of water, bring to the boil, season with salt and pepper, when it will be found both excellent and nutritious. This case contains the essence of three pounds of beef without the bone."

Examination.—This preparation has the colour and taste of the concentrated gravy of roasted beef; with the addition of water, it forms a very agreeable article of diet.

The contents of the canister opened by us were perfectly fresh and sweet.

21*st Sample.*—Purchased of Ritchie & M'Call, 137. Houndsditch, half-pint canister of *chicken-broth*, price 1*s.*

Examination.—The contents of this canister were perfectly unchanged, and in as fresh a state as though the broth had been but recently prepared.

22*nd Sample.*—Purchased of D. Hogarth & Co., 78. Cheapside, half-pint canister of *mutton-broth*, price 7*d.*

"The contents of this case are perfectly fresh, and will retain their sweetness and flavour in any climate for several years. After removing them into a saucepan, if a rich soup be required, add half as much water as the case will contain, but if a more economical soup be wanted, add as much water as the case will hold."

Examination.—The broth contained pieces of mutton, and a considerable quantity of carrot and other vegetables. When diluted with water in the manner directed, and warmed, it furnished a bowl of strong broth, in which, however, a taste slightly unpleasant was detected.

23*rd Sample.*—Purchased of J. H. Gamble, 137. Leadenhall-street, one-pint case of *soup and bouilli*, price 9*d.*

"Empty the soup and bouilli into a saucepan and warm it. It can be eaten cold. Some prefer to warm it in the canister, and then opening. A small quantity of water may be added if the gravy be found too strong; or by adding a quart of '*Gamble's* Concentrated Gravy,' with a sufficient quantity of water, to the soup and bouilli, while warming, it will make a tureen of delicious soup, and the bouilli can be served on a dish, garnished with carrots and gherkins, if approved."

Examination.—This constitutes a capital article of diet, and the contents of the canister tried by us were found to be in excellent preservation.

24*th Sample.*—Purchased of J. H. Gamble, 137. Leadenhall-street, one-pint case of *soup julienne*, price 1*s.* 2*d.*

"The soup merely requires to be warmed. A small quantity of water may be added if the soup be found too strong and rich. Be careful to stir it gently while warming in the saucepan, to prevent it burning."

Examination.—The soup julienne of Mr. Gamble is a strong beef soup, containing a large quantity of maccaroni and sliced vegetables, cut into ornamental devices. We noticed in it carrot, turnip, and celery. The condition of the article was excellent.

25*th Sample.*—Purchased of Cooper & Aves, 134. Leadenhall-street, one-pint case of *mock turtle*, price 1*s.* 1*d.*

Examination.—This article was in the state of incipient decomposition, and the flavour of the meat contained in it was such as to render it scarcely eatable. It was the least successfully prepared of all the provisions preserved in canisters, and examined by us.

26*th Sample.*—Purchased of Ritchie & M'Call, 137. Houndsditch, one-pint case of *Mulligatawny soup*, price 1*s.* 7*d.*

Examination.—This article was in capital preservation, and furnished a delicious plate of soup.

FISH.

27*th Sample.*—Purchased of Cooper & Aves, 134. Leadenhall-street, half-pint case of *Milton oysters*, price 1*s.*

Examination.—The oysters, as well as the fluid in which they were immersed, were both perfectly fresh and sweet, and possessed the saltish and marin odour and flavour for which this delicacy is so esteemed.

28*th Sample.*—Purchased of J. H. Gamble, 137. Leadenhall-street, o canister of *mackerel*, price 10*d.*

Examination.—The mackerel in this case was i

en retaining the mottled, bright, and silvery appearance peculiar to
when quite fresh.

e.— Purchased of D. Hogarth & Co., 78. Cheapside, two-pound canis-
resh herrings, price 1*s.* 2*d.*

rrings in this case are fresh as when caught, are sufficiently cooked,
eaten cold; but if required warm, boil the case before it is opened
e minutes, when they will be found fit for the table. The liquor con-
e case is a rich essence of the fish, and may be eaten with them when
in a warm or cold state."

tion.—The herrings in this canister were in excellent preservation.

MEATS.

e.— Purchased of Cooper & Aves, 134. Leadenhall-street, one-pound
boiled beef, price 1*s.*

tion.— The contents of this canister were in good preservation.

.— Purchased of Ritchie & M'Call, 137. Houndsditch, one-pound
r of *roast beef*, 1*s.* 1*d.*

he canister carefully, so that the contents may be taken out whole,
old. When used in a hot climate, or warm weather, every possible
ooling should be adopted previously to opening, so that the contents
ut in a gelatinous state."

tion.— The piece of roast beef contained in this case was tender, and
ly sweet.

PEMMICAN.

n consists of the muscular fibre of beef, baked, and reduced to a coarse
he preparation of the article has been described to us as follows: —
trimmed and deprived as far as possible of fat, is cut into slices,
laced on metallic plates, and baked until it becomes dry, hard, and
tly, the slices are reduced to a coarse and fibrous powder. The article
constitutes what is known as common pemmican.

e, however, other preparations of pemmican; thus, a proportion of
is commonly added, with the intention of restoring the fat of which
as necessarily deprived in order that it might be baked, and thus
the better adapted to serve all the purposes of nutrition and respi-
ain, to this mixture of muscular fibre and fat, in some cases sugar is
in others, currants.

n is prepared at Gosport in large quantities for the use of the navy,
ieve, is considered to form a valuable and nutritive article of diet.
en informed that the *North Star*, which is about to proceed in search
Franklin, has a large supply on board. It is used, particularly that
mixed with the cocoa given for breakfast, and the other kinds with
, or soup. Further information in regard to the preparation and use
n will be found, we believe, in "Sir John Richardson's Arctic Boat

samples of pemmican above noticed, as well as for information
its preparation, we are indebted to Mr. Stone, late librarian of the
ege of Surgeons. We had repeatedly tried at different times to
les of pemmican, but until Mr. Stone procured them for us, we had
r endeavours to meet with them.

e.— Common pemmican.

tion.— The article is of a light-brown colour, with a fibrous and
texture. In the dried state it has somewhat the taste of roasted beef.

e.— Pemmican with fat and sugar.

tion.— This form of pemmican possesses much the same character
receding, but it has a less woolly texture, and its sweet taste masks,
extent, the flavour of the meat.

e.— Pemmican with fat and currants.

tion.— This article is inferior to common pemmican, which retains
f the flavour of the meat.

les did not exhibit the slightest sign of change or decomposition, but
rfect state of preservation.

From a review of the table of examinations, the following general conclusions may be deduced: —

As regards the Preserved Vegetables —

1st. That of the three vegetables examined and enclosed in tin canisters, the *carrots* were in a perfectly fresh and sound state; the *turnips* were apparently sound, but when dressed and brought to table were seen to be very much discoloured; the *green peas* were not in a satisfactory state of preservation, being altered in colour, having but little flavour, and evincing signs of incipient decomposition.

2nd. That the vegetable *rhubarb*, contained in a bottle, and preserved according to the method devised by Mr. Sadlington, which has already been described, was in good condition.

3rd. That the several vegetables preserved under the process of M. Masson — viz., *cabbage*, *Brussels-sprouts*, *carrots*, *potatoes*, and *julienne*, were all sound and fresh, and in admirable condition in all respects.

4th. That the potatoes prepared under the patent of Mr. Edwards were likewise in a perfectly satisfactory state.

5th. That the fruits put up after the method of Mr. Sadlington were, with one exception, in a good state of preservation.

6th. That the apples prepared according to the patent of M. Masson, when soaked, as directed, in warm water, possessed the flavour unimpaired of the recent fruit.

With respect to the Preserved Animal Substances, the conclusions are: —

7th. That *Borden's Patent Meat Biscuit* was in a perfectly sound state, and that there is much reason to regard it as a valuable article of diet in the provisioning of ships, garrisons, &c.

8th. That the *extract of beef*, manufactured under the patent of Mr. Roberton, was free from the slightest taint, and possessed all the odour and flavour, to a remarkable extent, of beef recently roasted.

9th. That the *soups* were, with one exception, in which the article appeared to be in a state of incipient decomposition, of excellent quality, and in sound condition.

10th. That the preservation of the *milk* examined was not entirely successful.

11th That the three canisters of *fish* were all found to be in excellent condition, the fish being as fresh as on the day they were enclosed in the cases.

12th. That the cases of *boiled and roasted beef* were in good preservation.

13th. That the samples of *pemmican* exhibited no symptoms of change or decomposition.

It thus appears, that out of the *Thirty-four* samples of preserved provisions of all kinds submitted to examination, the condition of preservation of *Twenty-nine* was most satisfactory, the state of *Five* only out of the number being unsatisfactory, three of these being vegetables; and hence we deduce the further conclusion, that the several processes adopted for the preservation of vegetable and animal substances are, at least so far as regards home and domestic use, productive of satisfactory results. From the few cases, however, which have turned out unfavourably, it is evident that the greatest care is requisite in conducting the several steps of whatever process is adopted.

But it remains for us to inquire whether the processes employed for the preservation of meat in tin canisters are sufficiently certain and accurate to ensure its preservation for long periods, and under the trying circumstances to which it is exposed from continual motion on ship-board, and change of climate. For a solution of this point it is necessary that we consult other authorities.

In the little work on the Preservation of Food, quoted in our first Report, the following remarks occur bearing on this point: —

"A number of specimens of fish, vegetables, meat, gelatine, and particularly a case of real turtle, prepared by Mr. Morrison, twenty years ago, in the West Indies, were opened and exhibited in the course of the lecture, the quality and excellence of which may be collected from the reports given after an entertainment of which we are about to speak.

"Thomas Michael Gresham, Esq., of Roheny Park, who has taken a lively interest in promoting the views of the company about to be established in Dublin, for the preserving animal and vegetable food of every description, invited a number of distinguished individuals to partake of various specimens of provisions according to the new process, for the purpose of testing the system of preservation, and adding their testimony as to the great value and importance of the project proposed by Mr. F. Gamble. Mr. Gresham explained to the meeting a few of the many advantages which would result to the public by the introduction of so valuable and important an invention. By means of the preservative process, he stated that provisions could be kept for any length of time, and in any climate. The turtle of which they had just partaken, and which was opened eight days back at Dr. Meyler's lecture, had been preserved at the Bahama Islands, by Mr. Morrison, more than twenty years ago; and there was not a prepared specimen of meat, fish, or vegetable, brought to table, which had not been at least three years put into the canister, and yet the whole were found in a most perfect state of preservation."

In the different expeditions to the North Pole, the ships for many years past have been provided with large quantities of fresh preserved provisions, for the use of both the officers and crews. In Captain Parry's first voyage to the polar seas, from ten to twelve thousand pounds worth of these articles were supplied to him, and on his return Captain Parry reported on them to the following effect:—

"His Majesty's Ship *Hecla*, 9. December, 1820.

"Gentlemen, — In reply to your letter of the 28th ultimo, I beg leave to acquaint you that I feel it impossible to speak too highly of the preserved meats and soups supplied to his Majesty's ships *Hecla* and *Griper*, employed under my orders on the late expedition for the discovery of a north-west passage. Of the very large supply we obtained, not a single instance occurred of opening a bad canister of meat. Four or five bottles of vegetable soup and two or three of the concentrated gravy soup were unfit for use. With these few exceptions they were excellent, and proved a most invaluable acquisition to us in the absence of all other fresh supplies. I have the honour to enclose the opinions of the surgeons of the *Hecla* and *Griper*, and am, Gentlemen, your very humble servant,

W. E. Parry, Captain."

"To the Commissioners for Victualling
His Majesty's Navy, London."

Letters innumerable might be given, were it necessary, from commanders of vessels, and others, all testifying to the fact that meat preserved in tin cases may retain its freshness and flavour during periods extending over several years.

It thus appears that the principles upon which meat is preserved in tin cases are sound, and sufficient to answer every useful purpose, when carried into operation in a sufficiently careful manner; in those cases in which failures have occurred, they have been due almost constantly to the want of proper precaution.

Of all the processes used for the preservation of vegetable substances, there appears to be none so satisfactory as that of M. Masson.

That fruits preserved in bottles according to the method of Mr. Sadlington lose very considerably in flavour, is unquestionable, yet the process, on the whole, yields valuable results.

We believe that the most effectual means of preserving fruit, is by immersion in syrup; the expense of this, however, is too great to allow of its use in all cases.

Although it may appear perhaps somewhat invidious to institute comparisons between the results obtained by different manufacturers, yet, as we desire to make known all the facts which have come before us, we feel bound to state that the articles put up by Mr. J. H. Gamble, of Leadenhall-street, Mr. Dangar, of Billiter-street, City, and Messrs. Hogarth & Co., of Cheapside, and examined by us, have appeared to be in the soundest and best condition.

The business of a preserved provision merchant would seem to be one which is greatly extending, since there are now in London several manufacturers, in addition to those of whom we have made purchases, as the following:—H. W. Brande & Co., 11. Little Stanhope-street, May-fair; Da Costa & Tanqueray,

11. Great St. Helen's; Geddes & Yule, 78. Great Tower-street; D. Mackenzie 33. Chamber-street; and W. R. Mark, 1 & 2. Spitalfields-market.

It will be apparent that there are many articles preserved, not included in the list which we have given; but the majority of these are to be regarded rather as delicacies than as adapted for ordinary use, such as pâte de foies gras, truffes, perigord, anchois à l'huile, sardines à l'huile, Russia caviare, &c.

Some years ago a preparation, consisting of a combination of gelatine with arrow-root or wheat-flour, was sold by E. Lardner, of Piccadilly, under the names of *animo-vegetable powder*, or *anamalised arrow-root*. We are not aware whether these or any similar preparations are made now. They would form in many cases convenient and useful articles of diet, suited particularly for children and invalids.

We will now proceed to offer one or two suggestions which have occurred to us respecting the manner in which the canisters are filled. It appears that in many cases greater care is required in apportioning the relative quantities of the several ingredients. Thus, some canisters which we have opened have contained a great excess of fat; others have been almost destitute of it; in some there has been little or no gelatine, and in others the cases have been half filled with it. These objections apply, perhaps, mostly to the smaller canisters. As a general rule, we believe that the drier the condition of the article the more certain will be its preservation; and that where meat is packed up in gravy or soup, this should always be as concentrated as possible.

It is estimated that one pound of cooked and preserved meat, and deprived, as it always is, of bone, will go nearly as far as two pounds of raw meat, and in considering the price at which preserved provisions are sold this fact should be remembered. It is, nevertheless, necessary, before preserved provisions can come into general use in households, that a very great reduction in the prices should be effected; and in order to accomplish this reduction, no means so effective can be adopted as the preservation in large quantities of the different kinds of vegetable and animal substances, at those seasons and in those localities and countries in which they most abound, and where they are to be obtained at the cheapest rate.

Thus many years ago Mr. Morrison, perceiving how important it was to secure certain articles where they were to be obtained most readily, had the turtle, which is found in the Bahama islands in such quantities, killed, cut up, and packed in tin cases on the spot. He adopted a like practice with salmon.

Mr. Borden also obtains his supply of beef for the manufacture of his meat biscuits from the prairies of Texas.

Lastly, Mr. Dangar imports into this country largely, beef obtained in Australia. We have been at the trouble of paying Mr. Dangar a visit, and have examined the contents of some of the canisters put up in Australia four years ago, and are pleased to be able to state that they were in sound condition, the meat being tender, and its flavour excellent. As an illustration of the advantage of preserving provisions largely where they are to be obtained cheapest, we may mention that Mr. Dangar is able to sell his 6 lb. canisters of fresh beef from Australia, at 5¼*d.* per pound — that is, he can supply the cooked beef at a cheaper rate than it can generally be procured in this country in the raw state.

There is this great advantage, and one which ought materially to affect the prices of preserved meats, that the manufacturer is enabled to make use of every part of the animals intended for preservation; thus, from the bones, even the gelatine should be extracted.

Hitherto we have said nothing on the adulteration of preserved provisions, and this for the reason that they, if practised in any cases, are for the most part of a nature to escape detection: thus they consist chiefly of the substitution of one kind of meat for another. The only instance with which we are acquainted of improper substances having been found in the canisters was that of Gol recently exposed, in which pieces of hearts, livers, intestines, kidneys. detected, mixed up with other meats.

Messrs. Ritchie and M'Call have addressed to us a commu the following remarks occur relative to the process adopted

" We think it right to point out to you with referen

ears in this week's paper, that the *modus operandi* described by you as that
monly practised is only made use of by ourselves, and forms the subject of
tent introduced into this country in 1840. It differs from all other modes
his respect, that it enables us to obtain a *perfect* vacuum in the canister,
ch we maintain is essential to insure success. This can only be done by
lly closing the canister against the jet of steam issuing from the pin-hole,
, as you remark, success depends upon this being most dexterously performed.
v, the system of the other houses, which is that of Appert, relies entirely
n the coagulation of the albumen, and the decomposing or separation of the
es in the canister by continued boiling: they close the canister completely
re commencing to preserve. In some cases, indeed, they open the canister
a few minutes, and reclose it during the operation; but this is a modification
y introduced subsequently to Wertheimer's patent being taken out."

Ve may remark, on the above observations, that although the details as prac-
d by different manufacturers vary, yet in the two great principles upon which
nts are preserved, they all agree — viz. that the albumen should be solidified
heat, and the atmosphere excluded. In our first Report we stated that after
closure of the aperture in the lid, the case was submitted a *second time* to
action of heat, with the view, as we supposed, of expelling the last portions
air, and which, we suggested, escaped through pores in the tin. A doubt has
n raised whether this explanation is correct; the practice, at all events, is as
ted, and it is, moreover, one which experience has shown to be necessary.

EXTRACT OF MEAT.

To the Editor of THE LANCET.

Sir,—I have only just observed in THE LANCET of the 20th December, amongst
lies to correspondents, "Mr. J. Roberton — The preparation having been
laid," &c. I presume this refers to myself and the extract of meat, of which
ent you a sample. I therefore send you with much pleasure another portion,
I shall feel obliged by your examination and report of it. As you will per-
ve, it consists entirely of the albuminous and saline portion of the juice of the
h, extracted *cold*, and, by a peculiar arrangement in the evaporating process,
ained in the form of a dry powder, with a very limited application of heat.
ppears to me a valuable preparation in the hands of the medical man, and
ful and convenient to the patient. A cup of beef-tea, in every respect adapted
the purpose of nutrition, may be at once obtained by boiling three or four
spoonfuls of the extract in about half a pint of water for three minutes. The
ract, so long as it is preserved in a dry state, will of course remain unimpaired
any length of time. I believe it is the first time an extract of meat prepared
Liebig's principle has been offered for general use in this form.

I am, Sir, your obedient servant,

J. ROBERTON.

ford-street, Manchester, Jan. 1852.

.* The powder in question is of a light brown colour, and has exactly the
eable smell of roast beef. We have had a cup of beef-tea made from it, and
e with Mr. Roberton that, prepared from good and wholesome meat, it forms
he invalid and medical man a useful and valuable article. Under the micro-
e, the powder is seen to consist of granules and masses of various size,
h also exhibit a granular composition. (See p. 441.)

THE
BITTER BEER, PALE ALE,
OR
INDIA PALE ALE,
OF
MESSRS. ALLSOPP AND SONS, AND MESSRS. BASS AND CO.,
OF BURTON-UPON-TRENT.

In all those countries in which the vine tree is extensively cultivated, wine is the ordinary beverage of the population; while in England, the climate being unsuited to the growth of the vine, beer is the national beverage, and enters into the daily consumption of all classes of persons, from the richest to the poorest. It is therefore not extraordinary that any statement calculated to throw a suspicion on the genuine character of beer should be viewed with alarm by the public, and with the utmost concern by those engaged in its manufacture, whose pecuniary interests are of course very largely involved.

A statement of this kind has recently come before the public, in which it is asserted that strychnine, a deadly poison, is commonly employed by brewers in the manufacture of "bitter beer," or "pale ale."

Into the origin and foundation of this allegation, we propose fully to inquire in the following Report.

In the course of a lecture recently delivered at the "Conservatoire des Arts et Métiers," M. Payen is asserted to have stated that strychnine was prepared in large quantities in Paris, and that the French authorities had ascertained that it was destined for England, it being employed in the manufacture of the celebrated bitter beer of that country.

This statement, after having appeared in some of the French papers, and amongst others in the *Constitutionnel*, attracted the attention of some English journalists, who commented at some length upon it, incautiously treating the assertion as though its truth had been fully ascertained. At length the injurious statement made its way into the columns of the *Times* newspaper, and thus become universally disseminated.

It was impossible for the brewers of bitter beer, the preparation of which is confined to a small number of persons, to pass by without notice so grave a charge, and one so immediately affecting their interests. Accordingly the two chief firms, those of Messrs. ALLSOPP and SONS, and Messrs. BASS and CO., lost no time in publicly denying, in the most unequivocal terms, that strychnine, or any other deleterious substance was ever employed by them in the manufacture of their beer.

These celebrated brewers suggested that their bitter beer should be subjected to a rigorous chemical and microscopical examination, and expressed their willingness to place the inquiry in the hands of the "Analytical Sanitary Commission." They offered to throw open their breweries, stores, &c., in the most complete and unreserved manner, and afford every facility for the fullest investigation.

Feeling that the subject was one of great importance; that it involved the public health to a great degree, and also the pecuniary interests of a trade, which, from its magnitude, had almost assumed a national character; that it also affected the judgment of the medical profession by whom the bitter beers had been so strongly recommended—we ultimately agreed to undertake the inquiry upon the distinctly-declared condition that the results of the inv tigation and analyses, whether favourable or unfavourable to the reputation quality of the beer, should be unreservedly and faithfully communicated to public.

The importance of the subject will be duly appreciated when it is trychnia is the active principle of *nux vomica*, that it is remarkable for its se bitterness, and highly poisonous nature, *one-sixth of a grain* having known to prove *fatal*.

COMPOSITION AND PECULIARITIES OF THE BURTON WATER.

rton brewers have long been celebrated for the quality of their beer, and conjectures have been made, to account for the excellence and superiority article brewed in that locality.

s the general opinion, in which, we believe, the brewers themselves con- hat their success depends to a great extent upon the quality of the well- used.

is water, repeated analyses have shown, contains a very large quantity of ate of lime, a good deal of the sulphates of potash and magnesia, and a derable amount of carbonate of lime; the lime and magnesia in the state rbonate, being held in solution by carbonic acid, the excess of which is so as to redden blue litmus paper.

e Burton well-water, therefore, is evidently a very *hard* water, remarkable e quantity of earthy sulphates and carbonates contained in it, and, *à priori*, uld be considered from its chemical constitution but ill adapted for the se of brewing. That it is not so, however, has been shown by long ex- nce. A rational and scientific explanation of the cause of the superiority Burton well-water can now be afforded.

the course of boiling, the excess of carbonic acid in the water, by which rbonates of lime and magnesia are dissolved, is expelled, and these salts recipitated: again, the alkaline phosphates present in malt have the power composing and precipitating sulphate of lime, phosphate of lime and a le alkaline sulphate being formed; the greater part of the phosphate of so formed is re-dissolved in the acid generated during fermentation. The from being at first hard thus becomes comparatively soft, and in this is well suited for the extraction of the active properties of the malt and used in the manufacture of bitter beer.

e correctness of this explanation is clearly shown in the following ses: —

sis of the Water used in the Brewery of Messrs. ALLSOPP & Co., *by* Dr. HENRY BOTTINGER.

(Contents of Imperial Gallon.)

	Grs.
Chloride of sodium - -	10·12
Sulphate of potash - -	7·65
,, lime - -	18·96
,, magnesia - -	9·95
Carbonate of lime - -	15·51
,, magnesia - -	1·70
,, iron protoxide -	0·60
Silica - - - -	0·79
Total solid contents -	65·28

es a varying quantity of free carbonic acid, which keeps the carbonates ution.

e water is remarkable for its complete freedom from organic matter.

sis of Water used in the Brewery of Messrs. BASS & Co., *by* Mr. COOPER.

(Contents of Imperial Gallon.)

Uncombined carbonic acid, cubic inches - -		7·5
Carbonate of lime -	grains - -	9·93
Sulphate of lime -	,, - -	54·40
Muriate of lime -	,, - -	13·28
Sulphate of magnesia -	,, - -	·83
Total solid contents - - -		78·44

Analysis, showing the Saline and Mineral Ingredients contained in Samp Beer brewed by Messrs. ALLSOPP & SONS. *Taken from the Stores at B wall.*

(Contents of Imperial Gallon.)

	Grains.
Alkaline sulphates, chiefly of potash	78
Alkaline chlorides	28
Alkaline carbonates and phosphates	14
Phosphate of lime and magnesia, very fusible before the blowpipe	102
Total saline and mineral ingredients	222

Analysis, showing the Saline and Mineral Constituents contained in Samp Beer brewed by Messrs. BASS & Co. *Taken from the Stores at Blackw*

(Contents of Imperial Gallon.)

	Grains.
Alkaline sulphates, chiefly of potash	62
Alkaline chlorides	25
Alkaline carbonates and phosphates	19
Phosphate of lime and magnesia	91
Total saline and mineral ingredients	197

The two last analyses include, of course, not merely the saline constitue the water used in making the beers, but also those of the malt and hops ployed, consisting principally of phosphates.

It will be observed that the earthy salts, the carbonates and sulphates of and magnesia, which impart the quality of hardness to water, have disappe and that the Burton water, though hard at first, really becomes a soft wat contained in the beer.

But the chemical constitution of the Burton water explains also an circumstance connected with Burton ales. It is known that these ales spe become bright and clear, that they never require "finings" to be employed are fit for use almost as soon as brewed.

Now the depurating power of lime is well known, insomuch so, that it has been employed in the clarification of cane and other vegetable juices, and no doubt to the presence and precipitation of this substance that the actio the Burton water in rendering the beer transparent and bright is attributabl

Having thus determined the chemical composition and peculiarities of water used by Messrs. Allsopp & Sons, and by Messrs. Bass & Co., we will proceed to treat of the general qualities and strength of the bitter beers ma factured by these brewers.

ANALYSES SHOWING THE COMPOSITION AND STRENGTH OF MESSRS. ALL & SONS', AND MESSRS. BASS & CO.'S BITTER BEERS.

No. 1.

Analysis of Beer brewed March, 1851, by Messrs. ALLSOPP & SONS, for portation to India. Selected from the Stores at Blackwall of Messrs. Fr & Co.

(Contents of Imperial Gallon.)

	Grains.
Sugar	200
Gum	2,080
Bitter extract	810
Total solid extract	3,090
Alcohol, of spec. grav. ·794	3,540
Water	63,370
	70,000

Per-centage of alcohol, 5·05.

No. 2.

is of Beer brewed March 20th, 1851, by Messrs. Allsopp & Sons, for rtation. Selected from the Stores at Blackwall of Messrs. Byass & Co.

(Contents of Imperial Gallon.)

	Grains.
Sugar	320
Gum	2,110
Bitter extract	750
Total solid extract	3,180
Alcohol, of spec. grav. ·794	3,820
Water	63,000
	70,000

Per-centage of alcohol, 5·46.

No. 3.

is of Beer brewed March 3rd, 1852, by Messrs. Bass & Co., for home consumption. From the Stores at Blackwall.

(Contents of Imperial Gallon.)

	Grains.
Sugar	390
Gum	3,930
Bitter extract	760
Total solid extract	5,080
Alcohol, of spec. grav. ·794	3,983
Water	60,937
	70,000

Per-centage or alcohol, 5·69

No. 4.

is of Beer brewed November 25th, 1851, by Messrs. Bass & Co., for home consumption. From the Stores at Blackwall.

(Contents of Imperial Gallon.)

	Grains.
Sugar	420
Gum	2,660
Bitter extract	800
Total solid extract	3,880
Alcohol, of spec. grav. ·794	3,744
Water	62,376
	70,000

Per-centage of alcohol, 5·34.

different ages of the beers sufficiently explain the slight variations in the of the preceding analyses.

above general analyses are important. They show —

That the bitter beers of Messrs. Allsopp & Sons, and of Messrs. Bass Co., contain only a moderate amount of alcohol; and

That they contain an unusually large quantity of bitter extract, consting of the extract of hops.

stimating the quality and condition of beer, it is of great importance to in its specific gravity, since this indicates to a considerable extent the t of solid contents or extractive matter in the beer, which, as a rule, is t in the newest and strongest beers.

ould be remembered, however, that alcohol, being lighter than water, ls in some measure the amount of extract as estimated by the hydrometer, rendering the beer by so much the less dense as the proportion of alc greatest.

It should also be borne in mind that the sugar, as the beer ages, gra becomes converted into alcohol, and this again into acetic acid, and hen beers usually possess a low specific gravity.

The effect of age in diminishing the density of beer is clearly shown following tables of specific gravities: —

Table showing the Specific Gravities of different Samples of Beer of *Ages brewed by* Messrs. Allsopp & Sons.

Spec

1. From the stores at Blackwall, for home trade, brewed March 23rd, 1852
2. From the stores at Blackwall, for home trade, brewed Dec. 1851
3. From the stores at Blackwall, for exportation, brewed February 27th, 1852
4. From the stores at Blackwall, for exportation, brewed March, 1852
5. From the stock of Messrs. Wallis & Co., agents for home trade, brewed October, 1851
6. From the stock of Messrs. Child & Co., agents for home trade
7. From the stock of Messrs. Findlater, Mackie, & Co., agents for home trade
8. From the stock of Messrs. Daukes & Rodick, agents for home trade
9. From the stock of Messrs. Foster & Sons, agents for home trade
10. From the stock of Mr. Bovill, agent, brewed Nov. 1851
11. From the stock of Mr. Bovill, agent, brewed Jan. 1851
12. From the stock of Mr. Bovill, agent, brewed Dec. 23, 1850
13. From the stock of Messrs. Hibbert, agents for exportation
14. From the stock of Messrs. Friend & Co., at Blackwall, agents for exportation, brewed March, 1851
15. From the stores of Messrs. Byass & Co., at Blackwall, agents for exportation, brewed March, 1851

Table showing the Specific Gravities of different Samples of Beer of *Ages brewed by* Messrs. Bass & Co.

1. From the stores at Blackwall, for home trade, brewed April 27th, 1852
2. From the stores at Blackwall, for home trade, brewed April 28th, 1852
3. From the stores at Blackwall, for home trade, brewed March 3rd, 1852
4. From the stores at Blackwall, for home trade, brewed November 25th, 1851
5. From the stores at Blackwall, for exportation, brewed February 18th, 1852
6. From the stores at Blackwall, for exportation, brewed February 19th, 1852
7. From the stores at Blackwall, for exportation, brewed March 25th, 1852
8. From the stock of Messrs. Saunders & Cameron, agents for home trade
9. From the stock of Messrs. Daukes & Rodick, agents for home trade
10. From the stock of Mr. Fevenc, agent for home trade
11. From the stock of Messrs. Kinahan, agents for home trade
12. From the stock of Messrs. Crimp & Ward, export agents, brewed January, 1852
13. From the stock of Messrs. Crimp & Ward, agents for exportation, brewed December, 1851
14. From the stock of Mr. Halston, agent, brewed 1850

The above tables prove that the density of beers differs remarkabl ge. The nature of certain of the changes which take place in *old beer* is the following analysis: —

lysis of Beer brewed by Messrs. Allsopp & Sons, *Jan.* 1851. *Selected from the stock of* Mr. Bovill, *agent.*

(Contents of Imperial Gallon.)

			Grs.
Alcohol - - - - - -			1,160
Acetic Acid - - - - - -			200
Solid extract, consisting of	Sugar - -	100	3,320
	Bitter extractive,	710	
	Gum - -	2,510	
Water - - - - - -			65,320
			70,000

Per-centage of alcohol - -	1·65
Specific gravity of the beer -	1009

t may be well, in the next place, to consider how far the statement made, that
ychnia is employed in the preparation of bitter beer, is consistent with pro-
ility. In order to form an opinion on this point, it is necessary to obtain clear
as of the quantity of this substance necessary to impart bitterness to a given
k of fluid, to determine the chemical condition in which it exists in beer, and
scertain the amount of strychnia which may be introduced into the system,
h safety to health and life. With respect to its bitterness, we find that one
in only of strychnia imparts a decided and persistent bitterness to at least
000 grains of water, or upwards of half a gallon; but the taste of the same
ntity of strychnia is perceptible when diluted with 420,000 grains, or six
ons of water.

ut it must be remembered that most beers contain free acetic acid in variable
ount, and that, therefore, strychnia added to beer usually becomes converted
acetate of strychnia. Now this salt, although very bitter, is less so than
chnia itself; consequently, a larger amount of the combined alkaloid is
essary to impart the same degree of bitterness.

e have ascertained that not less than three grains of acetate of strychnia
needed to give a persistent and suitable bitterness to half a gallon of water;
therefore evident that not less than one grain and a half of strychnia in
bination with acetic acid would be required to impart such a degree of
erness to the same quantity of beer as to render its use in the preparation of
er beer a matter of any moment. Now a quantity of strychnia so consi-
able as this could not be taken in beer consistently with safety, or even
hout danger to life. Were the quantity present in beer much below this, its
would still be attended with the greatest danger, since there is much reason
believe that this poison, like digitalis, colchicum, and certain other active
etable products, is liable to be retained in the system, and to accumulate in
o such an extent, as at length to give rise to the tetanic spasms and other
nsequences symptomatic of poisoning by strychnia.

From all these considerations, therefore, we conclude that the statement
ade concerning the use of strychnia in beer, under any circumstances, is
arcely consistent with probability.

Analyses and Tests for Strychnia.

We now come to treat of the means by which the presence of strychnia in
er may be determined.

While chemical science, in its present condition, fails to detect many
mpounds derived from the organic kingdom, it is fortunate that this is not
case with the majority of the more deadly vegetable substances, as prussic
d, morphia, nicotina, brucia, and also strychnia.

Strychnine, or strychnia, is met with in two states—the one impure, the
er pure.

n its impure condition, it is in combination with another vegetable principle,
ned brucia, and for which there exists a very characteristic chemical test.

Commercial strychnia is very commonly impure, being admixed with a greater or less amount of brucia; much, however, of the strychnia manufactured contains very little of this principle, and is even frequently entirely destitute of it, so that no reliance, for the detection of strychnia, can be placed upon this contamination, since it is not constant. The principal test for brucia, and indirectly for strychnia, when the two occur together, is nitric acid, with which reagent a blood-red colour is developed.

For the alkaloid in its pure state there are likewise appropriate and most satisfactory tests.

The first and chief of these was proposed in 1843 by Marchand*, who showed that if a small quantity of strychnia be rubbed with a few drops of concentrated sulphuric acid, or oil of vitriol, containing a very minute proportion of nitric acid, no change of colour would ensue; but that on the addition of a small quantity of the puce-coloured oxide of lead, or even of litharge, a beautiful violet colour is immediately developed, which quickly changes, first to red, and then to an orange tint.

A modification of this test was subsequently proposed by Mack†, who suggested the substitution of peroxide of manganese for the oxide of lead. In this case precisely the same changes take place, and the same development and play of colours is produced.

Again, Otto‡ has suggested a further modification and improvement of the test by the employment of chromate of potash.

Lastly, Mr. Thompson recommended, in 1849, the use of bichromate of potash.§

One or two drops of strong sulphuric acid are to be allowed to fall on a minute quantity of strychnia, and in this a small fragment of bichromate of potash should be placed, around which a beautiful violet colour will be rapidly and continuously formed, so long as any of the strychnia or bichromate of potash remains undissolved and unacted upon.

The whole of these tests are exceedingly delicate and satisfactory—the last one particularly so; and by it so minute a quantity as the one-thousandth of a grain of pure strychnia may be detected. The colours developed are the same whichever reagent be employed, but the tints are seen to the greatest advantage when the chromate or bichromate of potash is used, on account of the solubility of these salts.

The reagents noticed all act in the same way—namely, by parting with oxygen, which passes to and oxidates the strychnia.

The advantage of the bichromate of potash over the chromate, is attributable to the much greater quantity of oxygen contained in it.

The identification of strychnia, when obtained in a separate and crystallised state, is therefore perfectly conclusive.

When, however, we come to operate upon a dense and complex liquid, such as beer, the difficulties are somewhat enhanced, since it is necessary to obtain, in a separate form, the strychnia dissolved in it. This object may be effected in at least two ways. The first method of separation is as follows:—

Half a gallon of the beer is to be evaporated to dryness in a water-bath; the extract is then to be treated with about ten or twelve ounces of alcohol, the mixture being occasionally stirred with a glass rod. The alcohol dissolves out the strychnia, and takes up scarcely anything else except some colouring matter. The alcoholic solution is then to be filtered, treated with a sufficient quantity of liquor plumbi diacetatis, filtered, treated with a few drops of dilute sulphuric acid, again filtered, evaporated to dryness, and the residue then tested with any of the reagents above described.

The employment of acetate of lead is rendered necessary to effect the separation of the small quantity of organic matter taken up by the alcohol, and the sulphuric acid is required in order to get rid of any excess of lead. The same object may be better attained in the following manner:—

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* Journal de Pharmacie et de Chimie, 3me Series, tom. iv., p. 200, 1843.

† Buchner's Repertorium, second series, vol. xliii.

‡ Pharmaceutisches Central Blatt, Dec. 30. 1846.

§ Pharmaceutical Journal, vol. ix. p. 24.

place of using alcohol, boil the extract with spirits of wine, filter, distil off irit, add a small quantity of solution of potash to the aqueous residue, and up with about an ounce of ether; this will take up the strychnia, and lighter than water, will float on the surface, leaving the impurities in the beneath. Lastly, the ethereal solution is to be evaporated, and the residue l.

other method of extraction is by means of animal charcoal. The ex- linary power possessed by this substance for absorbing gases and various bodies, especially those active principles of vegetables termed alkaloids, ll known; and of this property advantage may be taken in the present nce.

om two to three ounces of animal charcoal are to be diffused through half lon of beer, and allowed to digest in it with frequent agitation from eight elve hours. The beer is to be filtered, when it will be observed that it ost much of its colour and a portion of its bitterness; the charcoal, the of which should be collected on the filter, is then to be boiled with ten es of spirit of wine; and either of the plans described above may be ed for obtaining the strychnia in a state of purity.

the process of evaporation is one of considerable time and trouble, and as difficult to obtain a perfectly colourless residue in this way, the last od proposed for isolating the strychnia will be found the most convenient, ll as expeditious.

the method of purification by ether and potash be followed, the spirit of after filtration, is to be distilled off, the aqueous residue treated with forty drops of solution of potash; and, then, after the lapse of a few tes, an ounce or so of ether is to be added. This floats and holds the hnia in solution.

the second method of purification, the spirits of wine, after filtration, is treated with solution of diacetate of lead, about two drachms being usually ient; this, in combination with the organic matter which it throws down, be got rid of by a second filtration; lastly, a few drops of dilute sulphuric are to be added, the liquid again filtered, evaporated, and tested.

e two methods may even be combined, and the potash and ether may be l to the aqueous residue after the employment of the solution of lead and uric acid, and in this way a very pure ethereal solution may be obtained. e two plans, the necessary precautions being observed, the first is perhaps est.

ichever proceeding for the extraction and purification of the strychnia be ved, several precautions are required.

charcoal be employed for the extraction of the strychnia, it is not simply ient to add the charcoal to the beer, but both before and during filtration eer must be well shaken several times.

the method of purification by means of ether and potash be adopted, the of the spirits of wine used to separate the strychnia from the charcoal d be entirely distilled or evaporated off, which may be known to be the when the vapour evolved ceases to smell spirituous, and to be pungent. If recaution be not observed, the ether, in place of floating, will combine with ater and spirit.

e ether employed should be strong sulphuric ether, and it should not only ll shaken, with the aqueous residue, more than once, but should be allowed main in contact with it for about half an hour, so that it may have time to lve out the strychnia.

adding the potash care must be taken lest too little or too much be em- d; if too little be used, some of the organic matter will remain in suspension; f too much the aqueous solution will become darkened.

the plan of purification with acetate of lead and sulphuric acid be practised, ad must be added until it occasions no further precipitate, and the sulphuric lso, until the insoluble sulphate of lead ceases to fall.

en it is remembered that concentrated sulphuric acid darkens, and even organic substances of all kinds, the necessity for a complete separation of ganic impurities will become apparent.

green colour in the course of a minute or two almost constantly forms around the fragments of bichromate of potash, even when strychnia is not present, and this takes place very quickly indeed if any ether, sugar, or organic matter remains on the glass. It is possible that this colour, formed by the green oxide of chrome which becomes liberated, might be erroneously regarded as an evidence of the presence of strychnia.

We refer to all these particulars because unless pointed out they are calculated to lead, as they have more than once done with ourselves, to embarrassment and disappointment.

Before proceeding to analyse the samples, preliminary experiments were made with beer to which we had purposely added from half a grain to a grain of strychnia to the gallon of beer, and we found that we could invariably succeed in detecting, by the methods indicated, the presence of the poison in these minute quantities.

We thus perceive how conclusive are the tests employed for the detection of strychnia.

But we need not confine ourselves to chemistry in order to obtain evidence of the presence of strychnia in organic fluids, as physiology will disclose the fact almost equally well.

One gallon of beer, to which a grain of strychnia had been purposely added, was evaporated to an extract; this was boiled for nearly an hour in a mixture of ether and alcohol; the solution, after filtration, was evaporated, and the residue, of a soft consistence, was administered as a pill to a small rabbit. In the course of two minutes the animal became affected with convulsive twitchings; these were almost immediately succeeded by a paroxysm of convulsions, in which the animal threw himself on his side, the head and neck being thrown back, the hind and fore legs extended and drawn backwards. The first paroxysm was rapidly followed by others, and in less than five minutes after the administration of the pill the rabbit was dead, it having exhibited the peculiar symptoms which characterise poisoning by strychnia.

In the course of our examination of the samples of beer, the results of the analyses of which are given in the following tables, we have not confined ourselves to chemical methods of research, but have also employed the microscope when that powerful instrument was calculated to throw any light upon the subject; and, in the progress of our experiments, in addition to resorting to the aids furnished by chemistry and the microscope, we have appealed even to the evidence afforded by physiology and pathology.

ANALYSES OF THE BITTER BEER, PALE ALE, OR INDIAN PALE ALE, BREWED BY MESSRS. ALLSOPP AND SONS.

Twenty samples, procured as follows:—

1*st Sample.*— Selected from the stores at King William-street, London-bridge; from cask.

Analysis.— The products of *malt* and *hops*, and the constituents of *pure spring water. Not any other ingredient found, either organic or inorganic.*

2*nd Sample.*— Selected from the stores at Blackwall; from butt; brewed Jan. 9th, 1852.

Analysis.—Results the same as in the first examination.

3*rd Sample.*— Selected from the stores of Pale India Ale for exportation, at Blackwall, belonging to Messrs. Byass & Co.; from butt; brewed March 20th, 1851.

Analysis.—Results the same as in the first examination.

4*th Sample.*—Selected from the stock of India Pale Ale, for expor
Blackwall, of Messrs. Friend & Co., export agents, 2. Abc
from butt, brewed March, 1851.

Analysis.—Results the same as in the first examination.

5*th Sample.*—Selected from the stock of E. and G. Hib
bottled expressly for exportation.

Analysis.—Results the same as in the first examinati

r.— Selected from stock of Messrs. White and Price, agents, 45. and
ırk-lane; in bottle.
.— *Results the same as in the first examination.*

.—Selected from stock of Messrs. Moline, Harper, & Moline, agents,
laide-place, London-bridge; in bottle.
.— *Results the same as in the first examination.*

.— Selected from stock of Mr. N. Eastty, agent, 132. Upper Thames-
; in bottle.
.— *Results the same as in the first examination.*

.— Selected from stock of Messrs. Crimp & Ward, agents, 7. Old
-street; in bottle.
.— *Results the same as in the first examination.*

le.— Selected from the stock of Mr. W. Bovill, export agent, 63.
n-street, City; represents thirty butts, brewed 23d December, 1850.
.— *Results the same as in the first examination.*

le.— Selected from the stock of Mr. W. Bovill, export agent, 63.
n-street, City; represents sixty butts, brewed November, 1851.
.— *Results the same as in the first examination.*

le.— Selected from stock of Mr. W. Mabey, agent, 64. Cornhill; and
's Coffee House, Royal Exchange; in bottle.
.— *Results the same as in the first examination.*

le.— Selected from stock of Mr. Leonard Clow, agent, 19. Princes-
Fitzroy-square; in bottle.
.— *Results the same as in the first examination.*

le.— Selected from stock of Messrs. Findlater, Mackie, & Co.,
, 1. Upper Wellington-street, Covent-garden; from butt.
.— *Results the same as in the first examination.*

le.— Selected from stock of Messrs. Daukes & Rodick, agents,
-hall Vaults, Strand; from butt.
.— *Results the same as in the first examination.*

le.— Selected from stock of Messrs. Childs & Co., agents, 43.
ter-square; in bottle.
.— *Results the same as in the first examination.*

le.—Selected from the stock of Messrs. M. B. Foster & Sons, agents,
ook-street, Bond-street; in bottle.
.— *Results the same as in the first examination.*

le.— Selected from the stock of Messrs. G. and J. H. Blockey, agents,
rmyn Street; in bottle.
.— *Results the same as in the first examination.*

le.— Selected from the stock of Mr. G. R. Nisbett, 11. Jermyn-
St. James's; in bottle.
.— *Results the same as in the first examination.*

le.— Selected from the stock of Messrs. Wallis & Co., agents,
nk-street, Westminster; in bottle; brewed October, 1851.
.— *Results the same as in the first examination.*

ES OF THE BITTER BEER, PALE ALE, OR INDIAN PALE ALE BREWED BY MESSRS. BASS AND CO.

samples, procured as follows: —

.—Selected from the stores at Blackwall; in butt; brewed 25th
ıber, 1851; intended for home consumption.
.—The product of *malt* and *hops*, and the constituents of *pure spring*
Not any other ingredient found, either organic or inorganic.

le.—Selected from the stores at Blackwall; in butt; brewed 3rd
, 1852; intended for home consumption.
.— *Results as in the first examination.*

3rd *Sample.*—Selected from the stores at Blackwall; in hogshead; 5th March, 1852; intended for exportation.

Analysis.—Results as in the first examination.

4th *Sample.*—Selected from the stock of Messrs Saunders & Cameron, agents, 7. Hart-street, Crutched-Friars; in bottle.

Analysis.—Results as in the first examination.

5th *Sample.*—Selected from stock of Messrs. J. Hobson & Son, export 45. Leadenhall-street; in bottle; brewed March, 1851.

Analysis.—Results as in the first examination.

6th *Sample.*—Selected from stock of Messrs. Crimp & Ward, import 1. Cushion-court, Old Broad-street; in butt, brewed January, 1852

Analysis.—Results as in the first examination.

7th *Sample.*—Selected from stock of Mr. E. Favenc, 41. Threadneedle City.

Analysis.—Results as in the first examination.

8th *Sample.*—Selected from stock of Messrs. Crimp & Ward, import 1. Cushion-court, Old Broad-street; brewed December, 1851; bo March.

Analysis.—Results as in the first examination.

9th *Sample.*—Selected from stock of Mr. Leonard Clow, import 19. Princes-street, Fitzroy-square; in bottle.

Analysis.—Results as in the first examination.

10th *Sample.*—Selected from stock of Messrs. Findlater, Mackie, agents, Upper Wellington-street, Covent-garden; in bottle.

Analysis.—Results as in the first examination.

11th *Sample.*—Selected from stock of Messrs. Field, Wardell, & Co., agents, 22. Henrietta-street, Covent-garden; brewed March 6 bottled June 7, 1851.

Analysis.—Results as in the first examination.

12th *Sample*—Selected from stock of Messrs. Daukes & Rodick, 3. Exeter-street, Strand; in bottle.

Analysis.—Results as in the first examination.

13th *Sample.*—Selected from stock of Messrs. Childs & Co., Age Leicester-square; in bottle.

Analysis.—Results as in the first examination.

14th *Sample.*—Selected from stock of Messrs. M. B. Foster & Sons, 56, Brook-street; in bottle.

Analysis.—Results as in the first examination.

15th *Sample.*—Selected from stock of Mr. C. Halson, agent, 40. Cros Finsbury; bottled in 1850.

Analysis.—Results as in the first examination.

16th *Sample.*—Selected from stock of Mr. C. Halson, agent, 40. Cros Finsbury; in bottle; bottled March, 1850.

Analysis.—Results as in the first examination.

17th *Sample.*—Selected from stock of Mr. R. Miller, agent, 6. Cros Finsbury; in bottle; part of 30 hhds.; brewed 15th Nov., 1851.

Analysis.—Results as in the first examination.

18th *Sample.*—Selected from stock of Messrs. G. Pay & Son, ag Rodney-buildings, New Kent-road; in bottle.

Analysis.—Results as in the first examination.

19th *Sample.*—Selected from stock of Mr. Blockey, agent, 104. Ebur Pimlico; in bottle.

Analysis.—Results as in the first examination.

20th *Sample.*—Selected from stock of Messrs. Kinahan, Sons, & Smyth 8. Great Windmill-street, Haymarket.

Analysis.—Results as in the first examination.

We have now reported the results of the chemical and microscopical ation of FORTY SAMPLES of bitter beer, pale ale, or India pale ale, br Messrs. Bass & Co. and by Messrs. Allsopp & Sons, and obtained un umstances which precluded the possibility of error, fallacy, or of preparation or the selection.

Many of the samples were taken from the stores of Messrs. Allsopp & Sons, nd of Messrs. Bass & Co., at Blackwall and in the City, while others were rocured from the principal agents and bottlers in the metropolis. In all cases, he utmost facility for investigation was afforded.

Some of the Ales were destined for exportation, others for the home trade; whilst the dates at which they were brewed extended over a period of nearly wo years. Not any sample of beer analysed was brewed *after* the promulgation of the statement concerning the employment of strychnia.

The stores at Blackwall belonging to Messrs. Bass & Co., and Messrs. Allsopp & Sons, each comprise many thousand butts, hogsheads, and barrels of bitter beer, which, arranged in tiers, and piled one above the other, extend over a space of several acres. The whole of these stores were thrown open to us, and liberty given to tap whichever casks we chose to select. In the case of the agents and bottlers the same liberty of choice was permitted, and in this manner butt after butt was opened and samples taken.

It should be observed that the casks are all branded with the names of the brewers, and that in most cases a register is kept, not only at the breweries and stores, but also at the agents and bottlers, of the dates at which the different lots were brewed, all chance of mistake in the selection of the samples being thus obviated by reference to the marks and registries.

Under the above circumstances, and after the most scrutinising examination, microscopical, chemical, and physiological, we have failed to detect the smallest atom of strychnia, or, indeed, of any other ingredients than the products of malt and hops, and the constituents of pure spring water.

Unknown to, and wholly independent of ourselves, those distinguished chemists, Messrs. Graham & Hoffman, at the request of Messrs. Allsopp & Sons, subjected several samples of their bitter beer to analysis. In a published report, it is stated that they failed to discover the slightest trace of strychnia.

Those gentlemen likewise placed themselves in communication with M. Payen, with whom the report was stated to have originated, in order to ascertain from himself the exact nature of the statement made by him.

It appears that the charge made by M. Payen was founded on information obtained by M. Pelletier, the celebrated preparer of quinia and other alkaloids, in France, who at one time received an order for a large quantity of strychnia, the destination of which was at first unknown to him, but which he afterwards found was exported to England, and used, so he informed M. Payen, to complete the bitterness of certain kinds of beer.

"We have reason to know," write Messrs. Graham & Hoffman, "although it is not stated by M. Payen, that these remarks of Pelletier refer to a period of ten or twelve years past; and further, although not informed of the amount of the order, we have good authority to state that fifty or a hundred ounces would have been considered a large order for strychnia at that time. The calculation already given shows how utterly insignificant such a supply of strychnia would be for its imagined application in the pale ale breweries. It is likewise known that the manufacture of strychnia has not been on the increase in France of late years."

Finally, M. Payen expressed his regret that he had ever said the fraud *appeared* to have been practised; although, at the time, he accompanied this observation with the further remark that *the falsification had no doubt ceased.*

M. Payen excused the statement made by him, on the ground that he did not originate it, and that the charge had been made public in the year 1850, in a French work treating of the Adulterations and Falsifications of Food. We have procured the publication in question, and find that it refers to the matter rather as a vague and uncertain report, than as a distinct allegation of the use of strychnia by English brewers; the author, concluding his remarks on the subject in the following words:—"We hasten to say that this sophistication, like the preceding, is far from being based upon ascertained facts."*

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* Dictionnaire des Altérations et Falsifications des Substances Alimentaires, &c. p. 118.

From the pure and wholesome nature of the ingredients employed, the moderate proportion of alcohol present, and the very considerable quantity of aromatic anodyne bitter, derived from hops, contained in these beers, they tend to preserve the tone and vigour of the stomach, and conduce to the restoration of the health of that organ when in a state of weakness or debility.

These bitter beers differ from all other preparations of malt in containing a smaller amount of extractive matter, thus being less viscid and saccharine, and consequently more easy of digestion: they resemble, indeed, from their lightness, *a wine of malt* rather than an ordinary fermented infusion; and it is very satisfactory to find that a beverage of such general consumption is entirely free from every kind of impurity.

The admirers, therefore, of the bitter beer, manufactured by the celebrated brewers we have mentioned, may enjoy with advantage this, their favourite beverage. The report so commonly circulated, that it contained a deadly poison, was a severe reflection on the sagacity and judgment of the members of the medical profession, because it is perfectly well known that "bitter beer or pale ale" first acquired and afterwards maintained its general celebrity in consequence of the universal recommendation of our profession—a recommendation which is now found to have had the best possible foundation.

ON POISONOUS CAYENNE PEPPER.

Cayenne Pepper consists of the pods or seed-vessels, ground and reduced to powder, of different species of *Capsicum*, but principally of *C. annuum*, and *C. frutescens;* the latter species, being stronger and better flavoured, yields the best description of Cayenne pepper.

The genus capsicum belongs to the *Solanaceæ* or night-shade family, which also includes the potato-plant.

Capsicum annuum is a native of America, but is cultivated in the West and East Indies, and to some extent in green-houses, in England and other European countries.

It is an annual, herbaceous plant, and, according to M'Culloch, "one of the hardiest and most productive plants found in tropical climates, growing luxuriantly in almost all dry soils, however indifferent." In this country it flowers in July, and ripens its pods in October; when immature, the berries are green, and only gradually become red as they grow ripe; they are used both in the green and red states, and in the undried and dried conditions: in the recent state they are employed for pickling; when dried they are used in medicine; and, reduced to powder, they constitute Cayenne pepper.

The dried berries ordinarily sold as *chillies* are of this species; in this condition they are more or less shrivelled, oblong, broad at the base, pointed at the distal extremity, the calyx and stalk being usually adherent to the broad end. They vary much in size and form; the largest are two or three inches long, and at the base are an inch or more wide; they are distinguished, according to their size and shape, into long-podded, short-podded, and heart-shaped.

The pods of this capsicum are hot and pungent, but they have *no aroma.*

The pods of *Capsicum frutescens* constitute what is known as *guinea or bird-pepper*, and when ground they furnish the best description of Cayenne pepper. They are small, scarcely an inch in length, a line or two broad, and of a deep orange-red colour. Each berry encloses usually about a dozen flattened, reniform seeds.

The pods are hotter and more fiery than those of *C. annuum;* they are likewise to some extent *aromatic.*

Two other species of Capsicum have been denominated, from the form of the fruit, *Cherry chilly* or *Cherry pepper*—*Capsicum cerasiforme*, and *Bell pepper* or *Capsicum grossum*.

The composition of capsicum berries is shown in the following analyses made in the years 1816 and 1817.

BUCHOLT'S ANALYSIS.*

(1816.)

Acrid soft resin (*capsicin*)	4·0
Wax	7·6
Bitter aromatic extractive	8·6
Extractive with some gum	21·0
Gum	9·2
Albuminous matter	3·2
Woody fibre	28·0
Water	12·0
Loss	6·4
Fruit of *Capsicum annuum*, without seeds	100·0

BRACONNOT'S ANALYSIS.†

(1817.)

Acrid oil	1·9
Wax with red colouring matter	0·9
Brownish starchy matter	9·0
Peculiar gum	6·0
Animalised matter	5·0
Woody fibre	67·8
Salts: citrate of potash, 6·0 Phosphate of potash, and Chloride of potassium, 3·4	9·4
Fruit of *Capsicum annuum*	100·0

Of *capsicin*, the active principle of cayenne, Pereira gives the following account:—

"Obtained by digesting the alcoholic extract in ether, and evaporating the ethereal solution. It is a thick liquid, of a yellowish-red or reddish-brown colour, which becomes very fluid when heated, and at a higher temperature is dissipated in fumes. Half a grain of it volatilised in a large room causes all who inspire the air of the room to cough and sneeze. By exposure to air and light it solidifies; it is decolorised by chlorine; it is slightly soluble in water and in vinegar, but very much so in alcohol, ether, oil of turpentine, and the caustic alkalies; with baryta it forms a solid acrid combination."

Each capsicum berry is made up of three parts—an outer skin or epidermis, parenchyma, and seeds.

The *epidermis* consists of a single layer of flattened cells, tortuous and angular in form; viewed on the outer or upper surface, the borders of the cells are seen to be well defined. *Fig.* 135.

On the inner surface the cells are less angular, but more tortuous, the margins broader, and the lines of junction of contiguous cells indicated by rows of minute dots.

When fragments of the epidermis are seen immersed in water, numerous oil-globules of a globular form, and of a deep and beautiful orange-red colour, are visible; some of these are imbedded in the cavities of the cells, but the majority float freely in the surrounding water. *Fig.* 136.

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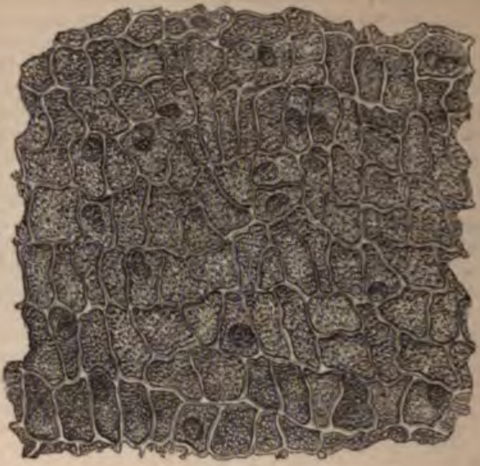
* Gmelin, Handb. d. Chem. ii. 1310.

† Ann. de Chim. Phys. vi. 122.

Fig. 135.

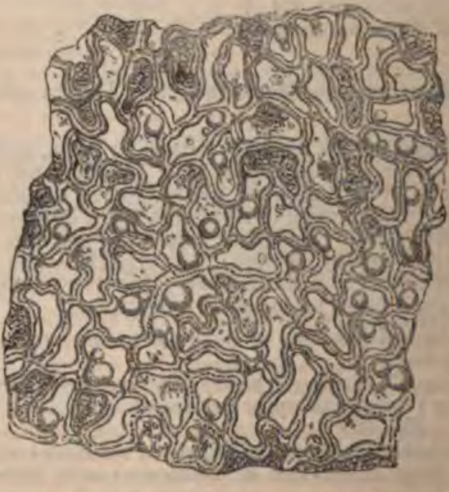
EPIDERMIS OF CAPSICUM BERRY.



A fragment of the *epidermis* of the capsicum berry, viewed on its outer surface.

Fig. 136.

EPIDERMIS OF CAPSICUM BERRY.



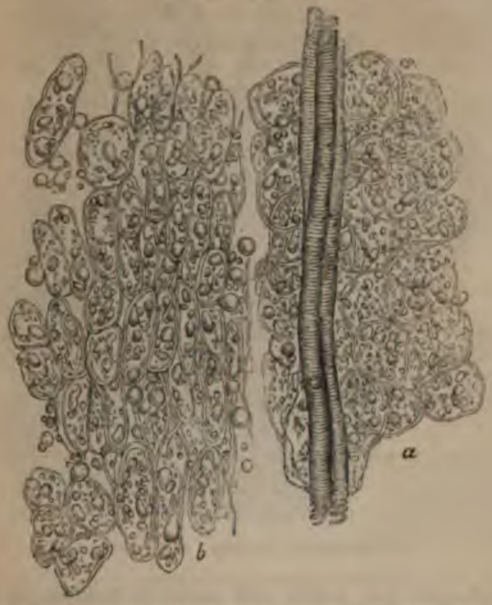
A fragment of the *epidermis* of the capsicum berry viewed on its inner surface.

The *parenchyma*, which unites the seeds with each other, and the who the peduncle, is likewise composed of cells, but these are smaller than t which the epidermis is formed; they are of a rounded or oval form, their are thin, and their cavities contain a very large quantity of oil, in the

ble droplets, many of considerable size, and which impart to this object,
ıder the microscope, a very beautiful appearance. *Fig.* 137.

Fig. 137.

PARENCHYMA OF CAPSICUM BERRY.



a. Parenchyma situated immediately beneath the epidermis; the cells in this situation are of a more rounded form, and are traversed by spiral vessels and woody fibre. *b.* The *parenchyma* surrounding the seeds.

eed, two parts — the covering of the seed and the seed itself — require
ribed.
vering of the seed possesses a very peculiar structure, which it is
lly to understand, and therefore not easy to describe accurately. It is
ht yellow colour, and of considerable thickness. Viewed under the
e, its outer surface presents a cellular texture, the margins of what
be the cells being thick, tortuous, and indented, and the cavities dark
ssed, as though they were rather apertures than the hollow interiors of

l sections of this covering present a very singular appearance; in this
pears as though composed of a number of tooth-like processes, having
at radiate disposition, with intervals between each process, the points
ts of the teeth being surmounted by a layer of the tortuous cells with
s, referred to in the previous paragraph.
d proper consists of minute angular cells, having thick and colourless
nd the cavities of which are filled with molecules and globules of oil
wish or reddish-yellow colour, but do not contain starch. *Fig.* 138.
l now proceed to cite the remarks of the principal writers on the subject
phistication of food, in relation to cayenne pepper and its adul-

sometimes adulterated," writes Accum*, "with red lead, to prevent
ing bleached on exposure to light. This fraud may be readily detected
g up part of it in a stopped vial containing water impregnated with

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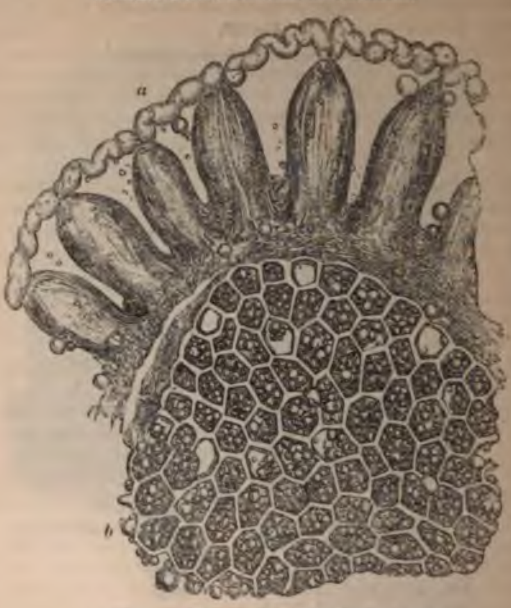
* Loc. cit. p. 293.

Fig. 138.

VERTICAL SECTION OF SEED OF CAPSICUM.



a. The *covering of the seed.* *b.* The *seed proper.*

sulphuretted hydrogen gas, which will cause it speedily to assume a muddy-black colour; or the vegetable matter of the pepper may be destroy throwing a mixture of one part of the suspected pepper and three of of potash (or two of chlorate of potash) into a red-hot crucible, in small tities at a time. The mass left behind may then be digested in weak nitric and the solution assayed for lead by water impregnated with sulphu hydrogen."

According to Brande[*], "many varieties of capsicum probably enter in composition of *cayenne pepper*, which consists of their powder mixed very variable proportion, but often about half of its weight, of commo Other adulterations are practised upon it, such as the addition of coloure dust, and, according to some, of red lead; this latter fraud is very easily d by the rapidity with which it sinks in water through which the pepper is di or by digesting it in dilute nitric or in acetic acid, and then applying filtered solution the usual tests for the detection of lead, such as sulph hydrogen and sulphate of soda — the former giving a black and the latter precipitate."

We find M'Culloch[†] stating that "cayenne is sometimes adulterat muriate of soda, and sometimes with a very deleterious substance — oxide of lead; but this fraud may be detected by its weight and by c tests."

"Cayenne pepper," writes Mr. Mitchell[‡], "is often subject to a ve terious fraud. It, when exposed to the light for any length of time, alwa the fine bright red colour it at first possesses, and therefore becomes dete in the eyes of the purchaser; in order to prevent this, a quantity of red added, which not only causes it to keep its colour for a greater length but also adds to its weight, and consequently to the profit of the vendor."

[*] Manual of Pharmacy and Materia Medica, 1839, p. 149.
[†] Dictionary, p. 943.
[‡] Treatise on the Falsifications of Food, p. 272.

ne pepper," according to Normandy*, "is often adulterated with
lt, finely pulverised *brick-dust*, and, it is said, even with *red lead!*
frauds may be readily detected by treating a portion of the sample
water, filtering, and testing the filtrate with solution of nitrate of
a white, curdy precipitate, or only a white turbidness, appears, com-
immediately soluble in ammonia, and re-precipitated by an excess of
, it is chloride of silver, and it indicates that chloride of sodium,
lt, is present. The precipitated chloride of silver is washed, dried,
weighed; 144 of chloride of silver represent 60 grains of common

rtion of cayenne pepper which remained in an insoluble state, after
with water, should now be treated by acetic or by nitric acid, and the
wn on a filter. A current of sulphuretted hydrogen must now be
ugh the filtrate; and if this produces a black precipitate, it is sul-
ead, and of course red lead was present.

resence of *brick-dust*, *ochre*, &c. may be ascertained by incinerating
which could not be dissolved by the acid; the above inorganic
will of course be left behind."

now proceed to describe the methods of investigation adopted in the
the results of which will shortly be detailed.

nple of cayenne was first subjected to microscopic examination, with
discovering whether any mineral colouring matter had been employed
the colour of the article; for it is not only vegetable structures that
cope is capable of detecting and discriminating, but by it also the
cayenne of even a *very minute quantity* of any coloured mineral
may generally be discovered.

g been determined in this way which of the samples were admixed
al colouring matters, the whole of the samples were next submitted to
icroscopic scrutiny, in order to ascertain whether any of them con-
, wheat-flour, turmeric, or any other description of foreign vegetable

roscopic examination of the samples being thus concluded, they were
ined chemically, for the purpose of determining the nature of the
redients employed.

s view, about half a drachm of each of the samples was burned to an
ucible. The ash was treated with about one scruple of strong nitric
after the lapse of three or four hours, two or three drachms of dis-
were added, and the mixture filtered: one part of the clear solution
for lead, and the other for iron.

s used for *lead* were hydrosulphuret of ammonium and iodide of
the first gives a black precipitate of sulphuret of lead, and the second
llow one of iodide of lead.

gives a greenish-black precipitate, both with hydrosulphuret of ammo-
sulphuretted hydrogen, and as this might lead to the erroneous
hat lead was present when it was not, it is proper in all cases to employ
of-potassium test.

ie quantity of lead present is considerable, a drop or two of hydro-
of ammonium allowed to fall into a test-tube containing a few grains
, suspended in distilled water, will afford tolerably certain indications
ence of that metal: the mixture will lose its bright colour, and gradu-
ially after the lapse of some hours, become dark and muddy.

be perceived by the quotations given, some writers advise that the
bstance should be dissolved by means of dilute nitric acid added to
ted cayenne. But when the solvent is applied in this manner, it
s satisfactorily, and the tests fail to give their characteristic reac-
e hydrosulphuret of ammonium may, indeed, give a black preci-
then it gives a somewhat similar one with iron, while iodide of potas-
y acts on the lead contained in such a solution at all; and if the
adulterated with starch, as it frequently is, we get a blue in place of

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* Handbook of Chemical Analysis, p. 155.

a yellow precipitate. It is therefore necessary, in testing for lead, to incinerate in all cases.

As *iron* is frequently contained in small quantity in capsicum berries, it is necessary, in order to determine the presence of this metal in unusual amount to perform, not merely a qualitative, but a quantitative, analysis, in every case in which lead was not ascertained to be present.

The tests employed for iron are either a solution of ferrocyanide of potassium or ammonia; by the first re-agent the iron is converted into Prussian blue, and by the second it is precipated in the state of hydrated oxide.

Having tested for both lead and iron, we shall have determined the nature of the mineral colouring agents employed in the majority of cases, whether it be red *lead* or some red earth containing iron, as *red ochre*, *Venetian red*, or *brick-dust*. But it will happen that in some few cases neither lead nor an excess of iron can be discovered; it will then be necessary to test for another substance occasionally employed — viz., cinnabar, vermilion, or sulphuret of mercury.

As *mercury* sublimes at a red heat, we cannot proceed in the analysis by incineration; the solvent must be added to the cayenne direct, and this solvent must consist of aqua regia, which is a mixture of nitric and hydrochloric acids, in the proportions of one part of the former to two of the latter acid.

About a scruple of aqua regia should be added to half a drachm of cayenne, and after an hour or two, a small quantity of distilled water; the mixture must next be filtered, and the excess of acid got rid of by evaporation, which must be conducted nearly, but not quite, to dryness; a little water must then again be added, and the solution tested.

The tests employed were liquor potassæ and iodide of potassium. The former gives a yellow precipitate, and the latter either a yellow or more commonly a beautiful scarlet-coloured precipitate of biniodide of mercury. The colour produced on the addition of iodide of potassium would always be bright scarlet, were it not that the presence of organic matter in the solution modifies the action of the test. The solution of iodide of potassium should be added in very minute quantity, as the iodide or biniodide is readily and almost instantly dissolved in an excess of this re-agent; and it should be known that very often, when the colour of the precipitate is rather yellow than red, after standing an hour or two it will frequently change to the characteristic scarlet hue.

But there is still another adulteration to which cayenne pepper is liable, which remains to be treated of — viz., that with *chloride of sodium*, or *common salt*.

Whenever the colour of any sample of cayenne is particularly deep and bright, and yet in which the microscope does not detect any mineral substance, this adulteration is to be suspected.

If, after exposure to the air, the colour of the suspected cayenne becomes deeper, and the paper stained and wetted, there can no longer be any doubt of the adulteration, and a chemical analysis is thus rendered, in the majority of cases, unnecessary. The saturation of the paper is due to the absorption of moisture from the air by the chloride of calcium or magnesium, with which salt is ordinarily contaminated.

In some doubtful cases, however, recourse must be had to chemical means of investigation.

There are two methods of proceeding which may be followed: either a portion of cayenne may be diffused through a large quantity of distilled water, which after filtration may be tested with nitrate of silver; or the cayenne may be incinerated, and the ash tested for the salt. Of the two methods, the latter is the best; for the salt is so incorporated with the oil or acrid substance of the cayenne, that it does not readily become disengaged by mere diffusion in water.

Much of the colour of cayenne is located in the acrid substance, which has many of the properties of oil, and on the presence of which the active properties depend. Now it is on this substance that salt acts, heightening its colour, extracting it from the cells, and rendering it more soluble; thereby not only deepening the colour, but increasing the pungency. In developing the colour, salt has the same effect as the alkalies, which are known to heighten greatly all vegetable colours.

To some it may appear as a somewhat harsh conclusion to regard the presence of salt in cayenne as an adulteration. That it is not so, however, will be evident, It is scarcely possible to conceive the amount of mischief that may be committed in this way, and we think that for the sake of the public health the interition of the Legislature is strongly demanded. The man who steals one's se commits a less crime than he who, by tricking our food, robs us of lth.

We think it right to state, that, since the above Report was in type, we have n informed that cayenne pepper is frequently imported in the ground state; s therefore probable that *some* of the adulterations discovered, and particularly t with salt, may have been practised in the localities whence the article is ported, and, therefore, before it reaches this country.

CURRY-POWDER, AND ITS ADULTERATIONS.

VERAL ingredients enter into the composition of curry-powder. The articles which genuine curry-powder of good quality ordinarily consists are, turmeric, ack pepper, coriander seeds, cayenne, fœnugreck, cardamoms, cummin, ginger, spice, and cloves. Of these, turmeric forms the largest proportion; next to s in amount are coriander seeds and black pepper; cayenne, cardamoms, mmin, and fœnugreck, form but a small portion of the article; while the ger, cloves, and allspice are in many cases omitted.

The properties and structure of several of the above ingredients have been eady fully described and illustrated; as turmeric, black pepper, cayenne, ger, cloves, and allspice; it thus only remains to give a description of the er ingredients which enter into the composition of curry-powder — namely, iander seeds, cardamoms, fœnugreck, and cummin seeds.

CORIANDER SEEDS.

Coriander (*Coriandrum sativum*) belongs to the natural family Umbelliferæ; s an annual plant of a foot or a foot and a half in height; it is cultivated in ex, and, although not really indigenous, is frequently met with growing wild the neighbourhood of Ipswich and some parts of Essex.

The fruit or seed-vessels are globular, about twice the size of white mustardds, and of a light brown colour. Each fruit consists of two hemispherical tions, termed *mericarps*, each of which is a seed; each mericarp exhibits on outer surface five *primary* ridges, which are depressed and wavy, and four *ndary* ridges, which are more prominent and straight. The channels are hout receptacles for the essential oil, or, as they are technically termed, *æ*; but near the commissures in each mericarp there is a small vitta, so that h fruit is provided with four of these receptacles.

The epidermis or husk is thick and brittle; when examined with the micrope, it is observed to consist of narrow fibres, which cross each other, and are posed in a waved manner. It is united to the seed by means of loose cellular ue, the cavities of the cells being empty. On the removal of the husk, these ls are torn through, some remaining attached to it, and the rest to the surface the seed. After the separation of the husk, the seed is still of a brown colour. neath the cells above described succeeds a delicate fibrous membrane; and xt to this is a layer of deeply coloured cells, which merge into the cells which m the substance of the seed; these are angular, with well-defined parietes, ir cavities enclosing oil in a molecular condition. The mature seed does not n starch. *Fig.* 139.

peculiar structure of the husk of coriander seeds affords a means by which ir presence in curry-powder may be readily determined.

Coriander seeds, like those of most plants belonging to the family Umbelliferæ, e mildly carminative, aromatic, and stimulant; they yield, upon distillation, a latile oil, upon which their properties depend.

17th Sample. — Purchased of Westbrooke & Co., 21. Oxford-street, in bottle
Adulterated — consisting of a mixture of *ground rice, turmeric*, and *cayen*
highly coloured with a very large quantity of RED LEAD.

18th Sample. — Purchased of Messrs. Hedges & Butler, Regent-street.
Adulterated — containing *salt*.

19th Sample. — Purchased of Messrs. Fortnum & Mason, Piccadilly.
Adulterated — containing a small quantity of *salt*.

20th Sample. — Purchased of Russell & Co., King-street, Covent-garden.
Adulterated — containing *salt*, perceptible to the taste, and coloured wit
ferruginous earth.

21st Sample. — Purchased of Brocksopp & Co., 234. Borough.
Adulterated — containing a large quantity of salt, together with a small qu
tity of RED LEAD.

22nd Sample. — Purchased of G. Pike, 77. High-street, Borough. 4*d.* per oz
Genuine.

23rd Sample. — Purchased of White & Fairchild, 63. Borough.
Adulterated — being vividly coloured with RED LEAD.

24th Sample. — Purchased of R. Jones, 16. Borough.
Adulterated. — Containing a considerable quantity of *rice* and much RED LE

25th Sample. — Purchased of W. Young & Sons, 27. High-street, Islington.
Adulterated. — Being coloured with RED LEAD.

26th Sample. — Purchased of C. Young, 8. High-street, Islington.
Genuine.

27th Sample. — Purchased of A. Braden, 13. High-street, Islington.
Adulterated. — Highly coloured with a considerable quantity of RED LEAD

28th Sample. — Purchased of H. Davis & Co., 23. High-street, Islington.
Adulterated. — Containing a very large quantity of *salt*, and coloured with
ferruginous earth.

Reviewing the results contained in the preceding table of analyses, it appears—

1st. That out of the twenty-eight samples of cayenne pepper subjected t
analysis, *twenty-four were adulterated*.

2nd. That out of the above number, *four* only *were genuine*.

3rd. That out of the twenty-four adulterated samples, *twenty-two* contained
mineral colouring matter.

4th. That RED LEAD, often in large and poisonous quantities, was present in
thirteen samples.

5th. That *Venetian red, red ochre, brick-dust*, or some other analogous ferru-
ginous earths were contained in *seven* samples.

6th. That CINNABAR, VERMILION, or SULPHURET OF MERCURY, was detected
in one sample.

7th. That *six* of the samples consisted of a mixture of *ground rice, turmeri*
and *cayenne*, coloured with either *red lead*, or a *red ferruginous earth*.

8th. That *six* samples contained large quantities of *salt*, sometimes alone, bu
more frequently combined with *rice* and a *red ferruginous earth* or with re
lead.

9th. That *one* of the samples was adulterated with a large quantity of the hu
of white mustard seed.

10th. That *two* contained *rice* only, coloured with *red lead* or a *ferrugin*
earth.

As is well known, RED LEAD, and VERMILION OR SULPHURET OF MERCUR
are highly deleterious substances, both being characterised by a disposition
accumulate in the system, and finally to produce symptoms of a very serio
nature. Thus it is that, however small the dose taken from day to day, t
constitution is sure to be at last brought under the influence of the poison, a
to become seriously affected.

But the quantity of red lead and mercury introduced into the system in adu
terated cayenne pepper is by no means inconsiderable, since it commonly for
a large portion of the article. Some idea of the amount of these substan
frequently present may be formed from the fact, that in a pinch of cayen
moistened and diffused over a white plate, or a piece of glass, they may be d
tinctly seen by the eye alone.

extremity to a blunt point; the seed-vessel is thick, tough, and fibrous,
nade up of cellular tissue and bundles of woody fibre, which spread out
e flower-stalk, and are visible on the surface to the naked eye, imparting
ted appearance characteristic of the seed-vessel of cardamom.

its interior, the seed-vessel sends off three prolongations or septa, which
into as many compartments; each of these contains several hard seeds
dish-brown colour, and exhibiting upon the surface peculiar markings;
s are united together by a gelatinous parenchymatous substance, which,
ie microscope, is seen to consist of numerous delicate tubules, filled with
r and oily matter.

overing of the seed, examined with the microscope, and viewed on its
rface, is observed to consist of a single layer of coloured cells, much
d, and of uniform diameter, terminating in rounded extremities, the
ing accurately adapted to each other. Beneath these are other cells,
ear a general resemblance in form to those previously described,
er in being more irregular, much more delicate, and in the absence of
they are disposed in an opposite direction to those of the outer layer.
). *A.*

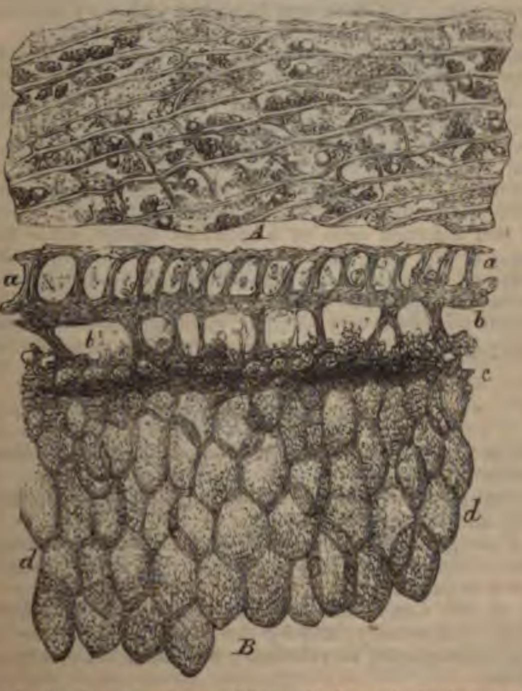
nsverse sections, the elongated coloured cells appear as small canals, of
ed form.

beneath the coating, and forming part of the seed, is a single row of

Fig. 140.

OUTER MEMBRANE AND TRANSVERSE SECTION OF A CARDAMOM SEED.

(Magnified 220 diameters.)



A. Portion of outer membrane, exhibiting the elongated cells of which it is composed. *B.* Transverse section of seed. *a a.* Cells forming outer membrane. *b b.* Receptacle-like cells. *c.* Layer of coloured cells. *d d.* Transparent and minutely-dotted cells, of which the substance of the seed itself is made up, and which are filled with starch-corpuscles.

large cells, resembling receptacles; next in order from without inwards is layer of small cells, deeply coloured; next to these succeed the cells which co stitute the principal part of the seed; these for the most part resemble clo the cells of pepper, being very angular, but they differ in their more delica and transparent appearance, and in being minutely dotted. *Fig.* 140. *B.*

Dr. Pereira, in his "Materia Medica," quotes the statement made by Schleide that he has discovered in the cells of cardamom "amorphous, paste-like starch We find the cells to be completely filled with minute, distinctly-formed starc granules, resembling closely those of rice. Probably the statement of Schleiden arose from his having employed but a feeble magnifying power in th examination of the seeds.

The presence of cardamom seeds in curry-powder is most readily determin by means of the dotted and angular cells which form the substance of the see

To the taste, cardamom seeds are sharp, warm, aromatic, and very like cam phor. They contain both a fixed and volatile oil; but their chief properties a due to the presence of the latter.

CUMMIN SEEDS.

The Cummin plant (*Cuminum Cyminum*) belongs, like Coriander, to natural order Umbelliferæ; it is a native of Upper Egypt, but is extensiv cultivated in Sicily and Malta.

Cummin seeds resemble somewhat caraway seeds, but they are larg straighter, and of a lighter colour. The fruit is double, like that of coriander a all other umbelliferous plants, consisting of two seeds or mericarps; each me carp has five *primary* ridges, which are filiform; and four *secondary* ridg which are prominent; but both are furnished with very fine hairs or prick and under each secondary ridge is a receptacle or vitta.

Transverse sections of a cummin seed exhibit the following structure:—

The hairs or prickles are composed of cells, the long diameters of which arranged in the long axes of the hairs. The husk or covering of the see made up of numerous rounded or angular cells, in the midst of which the la and triangular vittæ are situated; and between the husk and seed itself, ther usually a small space, which is formed by the contraction of the seed after it arrived at maturity. The surface of the seed is of a pale brown colour, and interior whitish and transparent. The exterior portion of the seed is constitu of elongated and flattened cells of a brownish colour, while the interior chief substance of the seed itself is composed of numerous distinct, ang cells, the walls of which are thick and perfectly transparent; their conte consist principally of oil. The seeds do not contain starch. *Fig.* 141.

Cummin seeds possess a very peculiar, medicinal taste and smell, and it i these that curry-powder owes the greater part of its characteristic flavour odour.

FŒNUGRECK SEEDS.

Fœnugreck seeds are the produce of *Trigonella Fœnum Græcum*, one of family Leguminosæ, or pea-tribe.

It is an annual plant, bearing yellow flowers, and grows principally in In Arabia, Sicily, and Montpelier.

The taste of the ground seeds is peculiar, but at the same time raw, and so what like that of beans; it is to these seeds that the characteristic flavou curry-powder is in part due.

According to Mr. Gray, the seeds are used by the inhabitants of the Indies in cases of dysentery, and by the Arabs as a poultice for wounds. England they are employed in veterinary medicine, but chiefly as an ingred in curry-powder.

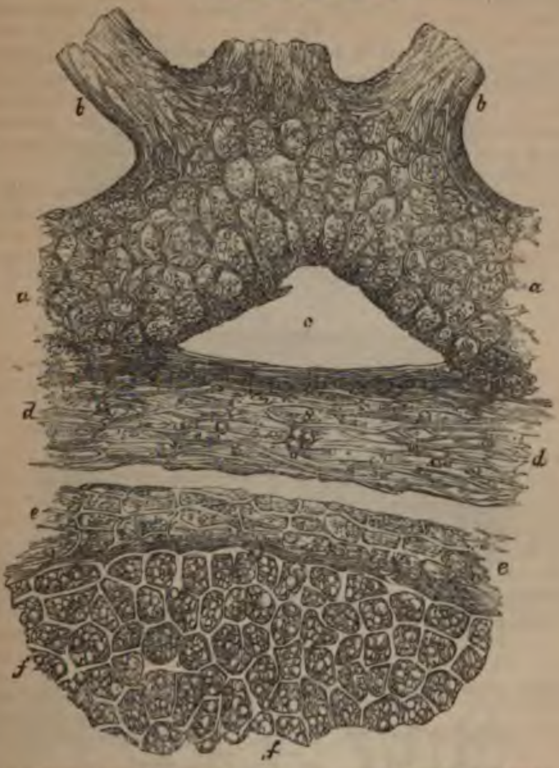
The seeds contain a large quantity of mucilage, and hence their infusion decoction are demulcent.

The structure of Fœnugreck seeds is very characteristic. The husk of seed consists of three membranes; the outer is formed of a single layer of which bear a remarkable resemblance in shape to a short-necked bottle

Fig. 141.

TRANSVERSE SECTION OF MERICARP OF CUMMIN.

(Magnified 220 diameters.)



a a. Cells forming the husk. *b b.* Commencement of two hairs or prickles. *c.* Receptacle or vitta. *d d.* Elongated cells which compose the innermost layer of husk. *e e.* Cells and fibres of which the external surface of the seed is formed. *f f.* Cells of the seed itself, containing oil.

iameter of these cells is disposed vertically, the narrow, neck-like part
most external, and forming the outer surface of the membrane. The
membrane consists of a single layer of cells, two or three times larger
e former, very much flattened, and having their margins regularly and
ully crenate. The third and innermost membrane is made up of several
of large transparent cells filled with mucilage; these cells expand greatly
mmersed in water. *Fig.* 142.

seed itself consists of two lobes, which are made up of numerous minute
those in the outer part of each lobe are of a rounded or angular form,
hose situated near the innermost part become much elongated, the long
f the cells being placed transversely in each lobe; the entire seed is
d by a single layer of small angular cells. *Fig.* 143.

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relating to the adulteration of curry-powder. Like many of the other
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Dr. Pereira, in his "Materia Medica," quotes the statement made by Schleiden, that he has discovered in the cells of cardamom "amorphous, paste-like starch." We find the cells to be completely filled with minute, distinctly-formed starch-granules, resembling closely those of rice. Probably the statement of M. Schleiden arose from his having employed but a feeble magnifying power in the examination of the seeds.

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To the taste, cardamom seeds are sharp, warm, aromatic, and very like camphor. They contain both a fixed and volatile oil; but their chief properties are due to the presence of the latter.

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Transverse sections of a cummin seed exhibit the following structure:—

The hairs or prickles are composed of cells, the long diameters of which are arranged in the long axes of the hairs. The husk or covering of the seed is made up of numerous rounded or angular cells, in the midst of which the large and triangular vittæ are situated; and between the husk and seed itself, there is usually a small space, which is formed by the contraction of the seed after it has arrived at maturity. The surface of the seed is of a pale brown colour, and its interior whitish and transparent. The exterior portion of the seed is constituted of elongated and flattened cells of a brownish colour, while the interior and chief substance of the seed itself is composed of numerous distinct, angular cells, the walls of which are thick and perfectly transparent; their contents consist principally of oil. The seeds do not contain starch. *Fig.* 141.

Cummin seeds possess a very peculiar, medicinal taste and smell, and it is to these that curry-powder owes the greater part of its characteristic flavour and odour.

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The taste of the ground seeds is peculiar, but at the same time raw, and somewhat like that of beans; it is to these seeds that the characteristic flavour of curry-powder is in part due.

According to Mr. Gray, the seeds are used by the inhabitants of the East Indies in cases of dysentery, and by the Arabs as a poultice for wounds. In England they are employed in veterinary medicine, but chiefly as an ingredient in curry-powder.

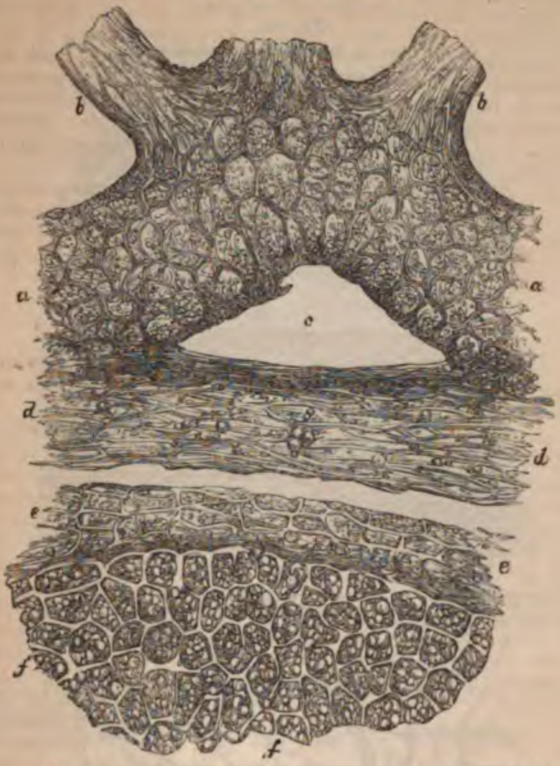
The seeds contain a large quantity of mucilage, and hence their infusion and decoction are demulcent.

The structure of Fœnugreck seeds is very characteristic. The husk of the seed consists of three membranes; the outer is formed of a single layer of cells, which bear a remarkable resemblance in shape to a short-necked bottle; the

Fig. 141.

TRANSVERSE SECTION OF MERICARP OF CUMMIN.

(Magnified 220 diameters.)



a a. Cells forming the husk. *b b.* Commencement of two hairs or prickles. *c.* Receptacle or vitta. *d d.* Elongated cells which compose the innermost layer of husk. *e e.* Cells and fibres of which the external surface of the seed is formed. *f f.* Cells of the seed itself, containing oil.

long diameter of these cells is disposed vertically, the narrow, neck-like part being most external, and forming the outer surface of the membrane. The second membrane consists of a single layer of cells, two or three times larger than the former, very much flattened, and having their margins regularly and beautifully crenate. The third and innermost membrane is made up of several layers of large transparent cells filled with mucilage; these cells expand greatly when immersed in water. *Fig.* 142.

The seed itself consists of two lobes, which are made up of numerous minute cells; those in the outer part of each lobe are of a rounded or angular form, while those situated near the innermost part become much elongated, the long axes of the cells being placed transversely in each lobe; the entire seed is covered by a single layer of small angular cells. *Fig.* 143.

In various works which we have consulted, we do not meet with a single remark relating to the adulteration of curry-powder. Like many of the other articles of which we have treated, this appears to have been neglected by writers on the adulteration of food.

It is necessary that each sample of curry-powder should not only be examined microscopically, but also be tested chemically for lead, mercury, and iron.

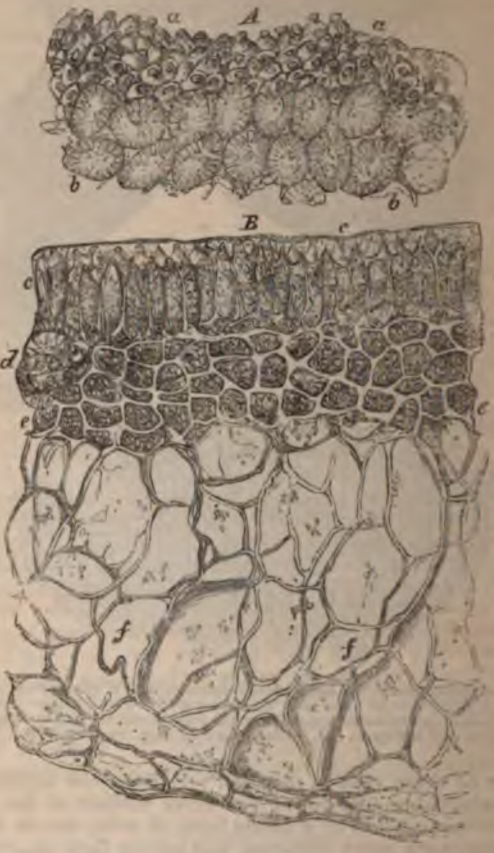
Since genuine curry-powder ordinarily contains a very large and variable quantity of iron, it is requisite to determine the exact amount of that metal

present. It is only when the quantity of iron detected is greatly above ordinarily contained in genuine curry-powder, that we can safely prono the sample to be adulterated with that metal.

Fig. 142.

OUTER COAT OR TESTA OF A FŒNUGRECK SEED.

(Magnified 220 diameters.)



A. Portion of the outer and second membrane stripped off; *a a*, peculiar bottle-like cells; *b b*, crenated cells of second membrane. *B.* Transverse section of husk of seed; *c c*, bottle-like cells; *d*, position of crenated cells; *e e*, layer of coloured cells merging into *f f*, the large cells which form the innermost membrane, filled with mucilage.

Results of the Microscopical and Chemical Analysis of Twent Samples of

CURRY-POWDER,

Purchased at the Establishments of various Grocers and Oilmen i Metropolis.

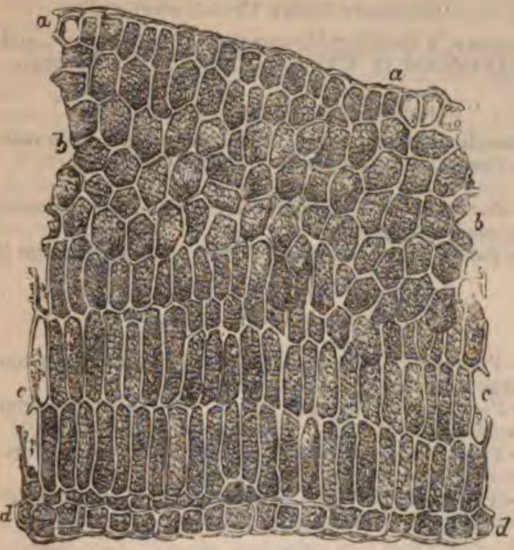
1*st Sample.*—Purchased of W. M. Nicholson, 86. Upper-street, Islington. *Contains* a small quantity of *salt.*

2*nd Sample.*—Purchased of Gluckner & King, 17. Mount-row, Islington. *Contains* very much *ground rice.*

Fig. 143.

TRANSVERSE SECTION OF LOBE OF FŒNUGRECK SEED.

(Magnified 220 diameters.)



a a. Layer of small angular cells on the surface. *b.* Rounded or angular cells. *c.* The same cells gradually becoming more elongated as they approach the inner part of lobe. *d.* Single row of cells forming the innermost margin of lobe.

3rd Sample.—Purchased of H. Davis & Co., 23. High-street, Islington.
Contains a proportion of *ground rice.*
4th Sample.—Purchased of C. Young, 8. High-street, Islington.
Genuine.
5th Sample.—Purchased of Beckett & Young, 3. High-street, Islington.
Genuine.
6th Sample.—Purchased of C. Roads, 11. Black Prince-row, Walworth.
Contains a proportion of *ground rice.*
7th Sample.—Purchased of W. Bourne, 109. Blackman-street, Borough.
Genuine, but consists principally of *turmeric-powder* and *cayenne.*
8th Sample.—Purchased of S. Jackson, 75. Blackman-street, Borough.
Contains a very small quantity of *salt.*
9th Sample.—Purchased of J. North, 135. High-street, Borough.
Contains a small proportion of *salt.*
10th Sample.—Purchased of Harrington and Lucas, 113. High-street, Borough.
Contains RED-LEAD and *salt.*
11th Sample.—Purchased of G. Pike, 77. High-street, Borough.
Contains very much *ground rice.*
12th Sample.—Purchased of Way & Co., 272. Oxford-street.
Contains a considerable quantity of RED-LEAD.
13th Sample.—Purchased of R. Drewe, 118. Tichfield-street.
Contains a considerable quantity of RED-LEAD, and a little *salt.*
14th Sample.—Purchased of J. Edwards, 10. Cambridge-street, Golden-square.
Genuine.
15th Sample.—Purchased of J. Bishopp, 51. Brewer-street, Golden-square.
Contains an immense quantity of *ground rice.*
16th Sample.—Purchased of R. C. Hall, 72. Princes-street, Leicester-square.
Contains RED-LEAD and a small quantity of *salt.*

17th Sample.—Purchased of G. Mills, 33. South Molton-street.
Genuine, but contains a small quantity of *powdered cassia.*

18th Sample.—Purchased of W. J. Brown, 12. High-Street, Islington. In package, labelled

"GENUINE INDIA CURRY-POWDER."

Contains RED-LEAD, a considerable quantity of *potato-flour*, and much *salt.*

19th Sample.—Purchased of White & Fairchild, 63. Borough. In package labelled

"SCHAH SOOJAH INDIA CURRY-POWDER."

Contains a considerable quantity of *ground rice*, and a little *salt.*

20th Sample.—Purchased of Fortnum & Mason, Piccadilly.
Genuine.

21st Sample.—Purchased of S. Dummer & Co., 14. Marylebone-street.
Contains very much RED-LEAD.

22nd Sample.—Purchased of Robinson, Piccadilly. In package labelled

"CAPTAIN WHITE'S CURRY-POWDER,
(Originally called SELIM'S.)"

Genuine.

23rd Sample.—Purchased of Bardsley & Co., 103. Tottenham-court-road.
Contains a large quantity of *ground rice.*

24th Sample.—Purchased of Andrews & Co., 107. Tottenham-court-road.
Contains a considerable quantity of RED-LEAD.

25th Sample.—Purchased of Salmon & Co., 69. Tottenham-court-road.
Contains RED-LEAD and a very large quantity of *ground rice.*

26th Sample.—Purchased of W. Gilbert, 92. Tottenham-court-road.
Contains a considerable quantity of *ground rice.*

From a review of the above Table of Analyses, the following conclusions may be deduced:—

Of the *twenty-six* samples of curry-powder submitted to microscopical and chemical examination,

1st. That *seven* only were *genuine.*
2nd. That *nineteen*, or nearly four-fifths were *adulterated.*
3rd. That *ground rice*, usually in very large quantities, was present in *nine* samples.
4th. That *potato-farina* was detected in *one* sample.
5th. That *salt* was present in *eight* of the samples.
6th. That the highly poisonous metallic oxide, RED-LEAD, was detected in no less than *eight* of the samples.
7th. That in *seven* of the samples, the adulteration consisted of *ground rice* only.
8th. That in *one* sample, the adulteration consisted of *ground rice* and *salt.*
9th. That in *one* sample, the adulteration consisted of *ground-rice* and RED-LEAD.
10th. That in *three* samples, the admixture consisted of *salt only.*
11th. That in *three* samples, the adulteration consisted of *salt* and RED-LEAD.
12th. That in *three* samples the adulteration consisted of RED-LED only.
13th. That in *one* sample, the adulteration consisted of RED-LEAD in combination with *potato-farina* and *salt.*

The above results do not give the whole of the adulterations to which the twenty-six samples have been subjected, since they do not include the FERRUGINOUS EARTHS, which were shown, in our article on Cayenne, to be so frequently employed to impart colour to that substance. In consequence of the large and variable quantity of iron present in genuine curry-powder, it is not easy accurately to determine in what cases that metal exists in excess. The ferruginous earths consist of alumina, in combination with a small and variable amount of iron in the condition of red oxide.

We have thus shown that curry-powder is adulterated to nearly the same extent, and frequently with ingredients equally pernicious, as the subject of our *last report*, namely, cayenne.

The presence of RED-LEAD in curry-powder is due, no doubt, to the adulterated cayenne pepper employed in its preparation. The same explanation accounts also, in many cases, for the presence of the salt.

Since the quantity of curry-powder taken at a meal is so considerable, its adulteration with RED-LEAD is even more prejudicial and dangerous than in the case of cayenne pepper.

The whole of the ingredients required for making curry-powder may be obtained of most seedsmen, and may be readily procured of Mr. Butler, of Covent Garden Market.

With a common pestle and mortar the seeds may be reduced to powder, and thus the housekeeper may herself prepare genuine curry-powder, of the best quality, at a cost of about 2*d.* per ounce. Since curry-powder is retailed at 6*d.*, 8*d.*, and even 1*s.* an ounce, it evidently bears an enormous profit. What, then, must be the gain upon the sale of an article which is made up principally of turmeric powder, salt, ground rice, and inferior capsicum berries? and of such a mixture many of the curry-powders purchased at the shops almost entirely consist.

ON POISONOUS BOTTLED FRUITS AND VEGETABLES.

In the Report on Preserved Provisions already published, the following observations were made respecting the preservation of bottled fruits:—

"Currants, gooseberries, cherries, and other soft fruits, have been preserved for use in winter by gathering them when not too ripe, and when very dry, putting them unbruised into dry bottles, which are afterwards well corked, and then buried in the earth. This method acts partly by the exclusion of the air, and partly by the low and uniform temperature which prevails beneath the surface of the earth.

"The efficiency of this method of preservation is increased by immersing the bottles containing the fruit for a few minutes, and previous to corking, in hot water. By this proceeding the vegetable albumen, which is so prone to pass into a state of decomposition, is solidified, and rendered less disposed to undergo putrefactive changes.

"A further improvement on this method was suggested so far back as the year 1807, by Mr. Saddington, who received from the Society of Arts a premium for 'A Method of Preserving Fruits without Sugar for House or Sea Stores.'

"The fruit is to be gathered before it is too ripe; the bottles are to be well filled with it, and loosely corked; they are next to be placed in a vessel containing cold water, which should reach as high as the necks of the bottles; heat is then to be applied, and the temperature raised to from 160° to 170°, and maintained at this for half an hour; but the heat must not be raised higher nor continued longer, as the fruit would be liable to burst. Lastly, the bottles are to be filled to within an inch of the corks with boiling water; they are to be well corked immediately, and laid upon their sides, so that the water may swell the corks, whereby the entrance of the air will be more effectually prevented."

An attentive examination with the eye alone, of various samples of bottled fruits and vegetables, served to raise suspicion, and to produce the impression that the method of preservation adopted by modern preservers of these articles was not quite so harmless as that originally proposed by Mr. Saddington. We felt, indeed, a strong conviction that the same means of coloration was resorted to in the case of bottled fruits and vegetables as we had already ascertained to be employed with pickles. In order to determine whether this conviction was well founded or not, we resolved to institute a series of rigor [illegible] results of which we are now about to make known.

The extraordinary effect of copper, in heightening a [illegible]

the green colour of fruits and vegetables, has already been remarked upon in the Report on Pickles. This action is exerted upon the green contents of the cells, the chlorophylle, and hence it is the coloured portions of vegetables and fruits, as those invested by the epidermis, which are most affected by this substance. The copper used accumulates in this membrane as a salt, as an acetate, a citrate, or a malate of copper.

The presence of copper, however, in fruits and vegetables is not confined to the coloured portions; it penetrates through the whole tissue, and a considerable part of the metal used even remains diffused throughout the fluid in which the vegetable substance is contained: hence it is desirable to analyse for copper not only the preserved article itself, but also the fluid in which it is immersed.

The processes for examination adopted in the subjoined analyses were as follows:—

First. About three ounces of the juice or fluid in which the fruit or vegetable was preserved were measured out, placed in a test-glass, and the acidity having been slightly increased by the addition of about three drops of strong nitric acid, a polished rod of iron was placed in the fluid, and allowed to remain for about twenty-four hours. If copper was present in considerable amount, the surface of the rod, from top to bottom, became covered with a continuous and bright coating of that metal. If the amount of copper was less considerable, the upper half or so only of the rod received the coating. If the quantity was very small indeed, no perceptible deposit of copper took place.

Hence we perceive that the iron rod affords a simple and most conclusive test for copper in fruits and vegetables, when present in anything like considerable amount; and that it even serves to indicate, to a certain extent, the quantity of copper with which the juice of different samples is impregnated, as shown by the rapidity with which the deposit occurs, by the thickness of the coating, and by the extent of surface covered by it.

Second. Three ounces of each of the fruits and vegetables were weighed out, placed in crucibles, and incinerated until nearly the whole of the carbon was dissipated, the colour of the ash being carefully noted. In those cases in which the fruit or vegetable was not contaminated with copper, the residual ash was observed to be either white or greyish white, while in those instances in which copper was present it was constantly of a pink colour; the depth varied uniformly with the amount of copper present.

When fruit or vegetable substances are carefully incinerated without being in any way disturbed, the general form of the fruit, &c., is in most cases tolerably well preserved; and it is then perceived that the pink colour is confined principally to the surface of the substance incinerated.

In those cases in which the amount of copper is but very small, the pink will be seen on the surface, only here and there, and will be of a pale tint. Where the quantity is larger, although still but small, the colour will be more general and more decided. Where it is abundant, the whole surface of the ash will be of a bright and beautiful rosy pink hue. Lastly, when the quantity of copper present is very considerable, the residual ash will be of a deep pink colour.

Olives, when incinerated, do not leave a clean white ash, so that although the pink colour may be very well detected in them, it is not of so bright a colour as in other fruit; but the colour is not confined, as in most other cases, to the surface of the fruit, but extends through the whole substance.

When a portion of the juice was incinerated along with the fruit, as was usually the case, the crucibles, if copper was present, became tinted with the same rosy pink colour as was observed on the surface of the fruit or vegetable incinerated. In some cases where the amount of copper was considerable, the bottoms of the crucibles became deeply and beautifully stained of a bright and iridescent pink.

The pink colour of the ash is thus explained: In the course of incineration, the vegetable acid with which the copper was combined, is destroyed, the highly characteristic pink oxide remains in the fruit perhaps in combination with lime, and its presence becomes revealed by its peculiar colour.

We have, then, in the colour of the ash a certain and beautiful test for the presence of copper, even in the most minute quantities, and likewise for the

FRENCH OLIVES.

mple.—Purchased of J. Wilmott & Co., 66. Gracechurch-street.
ins *a very large quantity of* COPPER. An iron rod immersed in the fluid
hich the fruit is preserved became *thickly coated with copper.* Ash of
eep but dirty pink colour; solution of the ash tested with ammonia
nged to *a rich blue.*

mple.—Purchased of J. Burgess & Son, 107. Strand.
ins a *considerable quantity of* COPPER. An iron rod immersed in the
l in which the fruit is preserved became *coated with copper.* Ash of a
but obscure pink colour; solution of the ash tested with ammonia turn-
decidedly blue.

mple.—Purchased of C. Wix & Sons, 22. Leadenhall-street.
ins *a considerable quantity of* COPPER. An iron rod immersed in the
l in which the fruit is preserved became *coated with copper.* Ash of an
ure pink colour; solution of the ash treated with ammonia *decidedly*

mple.—Purchased of Harrington & Lucas, 74. Princes-street, Leices-
square.
ins *a small quantity of* COPPER; solution of the ash tested with ammonia
me of *a pale blue colour*, a *slight deposit of copper* taking place on a
shed iron rod immersed in the acidulated solution of the ash. The
t of a yellowish-olive colour, very different from that of the other
ples.

mple.—Purchased of Sams & Co., 173. Piccadilly,
ins *a very considerable quantity of* COPPER. An iron rod immersed in
fluid in which the fruit is preserved became *quickly covered with a thick*
osit of copper. Ash of a *deep but obscure pink* colour; solution of the
treated with ammonia turned of a *deep blue.*

mple.—Purchased of G. Neighbour & Sons, 149. Regent-street.
ins *a small quantity of copper.* Ash *slightly pink;* solution of the ash
ted with ammonia, *faint blue.* As viewed through the bottle, the olives
is sample appeared of a deep green colour, conveying the impression
they were highly coloured with copper. On removing them, however,
the bottle, they were seen to be of a dull yellowish-brown, and it then
me evident that the green colour was entirely due to the intensely-
ured bottle.

SPANISH OLIVES.

mple.—Purchased of Hedges & Butler, 155. Regent-street.,
trace of copper. Ash *white.* The olives in this case were of a fawn
ur, without a tinge even of green. We believe that Spanish olives are
erally sold in their natural state, and are almost invariably free from
contamination with copper. In the case of French olives the object
ars to be to render them as green as possible; and this is effected by
free use of copper, as well as enclosing them in deep green bottles.

LIMES.

mple.—Purchased of J. Boyd, 59. Piccadilly. In bottle, labelled thus:

AUGUSTUS S. LEVY,
ENGLISH AND FOREIGN FRUITERER,
59. PICCADILLY.

ns *a very small quantity of* COPPER. Ash *a little pink here and there.*
tion of the ash treated with ammonia became of *a faint blue* colour.

mple.—Purchased of Fortnum & Mason, 182. Piccadilly.
ns *a good deal of* COPPER. Ash of *a decided pink* colour; solution of
ash treated with ammonia, *light blue;* an iron rod immersed in the
lated solution of the ash became *slightly coated with copper.*

8th Sample.—Purchased of E. & J. Freeman, 3. Wigmore-street.

Contains *a small quantity of* COPPER. Ash *somewhat pink.* Solution of the ash, tested with ammonia, of a *faint blue.*

9th Sample.—Purchased of Crosse & Blackwell, 21. Soho-square.

Contains *a good deal of* COPPER. Ash of a *light* but *decided pink.* Solution of the ash, tested with ammonia, becoming of a *pale blue* colour; *a coating of copper* also being deposited on a rod of iron immersed in the acidulated solution.

10th Sample.—Purchased of Castell & Brown, 45. Princes-street, Leicester-square.

Does not contain copper. Ash of a *white* colour. The appearance of the gooseberries, in this case, differs remarkably from those of all the previous samples. The fruit is of a yellow colour, with scarcely a tinge of green. We have seen, in shop-windows at the West-end, gooseberries precisely resembling these in colour, and we believe, if inquiries were made, that in most cases it would turn out that the parties were supplied by Messrs. Castell & Brown.

GREENGAGES.

11th Sample.—Purchased of G. Whybrow & Co., 4. Minories.

Contains *a very considerable quantity of* COPPER. An iron rod immersed in the fluid in which the fruit is preserved became covered with *a thick coating of copper.* Ash of a *decided and rather deep pink* colour. Solution of the ash, tested with ammonia, changed to a *decided blue.*

12th Sample.—Purchased of Crosse & Blackwell, 21. Soho-square.

Contains *a very considerable quantity of* COPPER. An iron rod immersed in the fluid in which the fruit is preserved became *thickly coated all over with copper.* Ash of a *decided and rather deep pink* colour; solution of the ash, tested with ammonia changed to a *bright blue.*

13th Sample.—Purchased of E. Lazenby, 6. Edwards-street, Portman-square.

Contains *a very considerable quantity of* COPPER. An iron rod immersed in the fluid in which the fruit is preserved became *thickly coated with copper.* Ash of a *decided and rather deep pink colour*; solution of the ash tested with ammonia changed to a *bright blue.*

14th Sample.—Purchased of R. & C. Faulkner, 44. Jermyn-street.

Contains a *very considerable quantity of* COPPER. An iron rod immersed in the fluid in which the fruit is preserved became *thickly coated with that metal.* Ash of a *decided pink colour;* solution of the ash tested with ammonia changing to a *bright blue.*

It should be remarked, that in all the above cases, the greengages, as contained in the bottles, presented to the eye a suspicious and unnatural deep bluish-green colour, which was much heightened by boiling; in this state the fruit exhibited, in fact, the characteristic verdigris hue.

15th Sample.—Purchased of Hedges & Butler, 155. Regent-street.

Contains *a trace of copper only.* Ash *nearly white,* with a *shade of pink* here and there; solution of ash treated with ammonia became of *a very faint blue colour.*

16th Sample.—Purchased of Fortnum & Mason, 182. Piccadilly.

Contains *a small quantity of copper.* Ash *decidedly pink;* solution of ash treated with ammonia became *light blue.*

17th Sample.—Purchased of Castell & Brown, 45. Princes-street, Leicester-square.

Contains *a trace of copper.* Ash *slightly pink here and there.* Solution of ash treated with ammonia became *very faintly blue.* The greengages in this case were of large size, firm, and plump, the colour being well preserved and natural.

18th Sample.—Purchased of Howis & Masson, 216. Piccadilly.

Contains *a very small quantity of* COPPER. Ash *here and there slightly pink.* The greengages in this case were of large size, firm, and plump, the colour being well preserved without presenting an unnatural appearance.

French Olives.

th Sample.—Purchased of J. Wilmott & Co., 66. Gracechurch-street.

Contains *a very large quantity of* COPPER. An iron rod immersed in the fluid in which the fruit is preserved became *thickly coated with copper.* Ash of a *deep but dirty pink* colour; solution of the ash tested with ammonia changed to *a rich blue.*

th Sample.—Purchased of J. Burgess & Son, 107. Strand.

Contains a *considerable quantity of* COPPER. An iron rod immersed in the fluid in which the fruit is preserved became *coated with copper.* Ash of a *deep but obscure pink* colour; solution of the ash tested with ammonia turning *decidedly blue.*

1st Sample.—Purchased of C. Wix & Sons, 22. Leadenhall-street.

Contains *a considerable quantity of* COPPER. An iron rod immersed in the fluid in which the fruit is preserved became *coated with copper.* Ash of an *obscure pink* colour; solution of the ash treated with ammonia *decidedly blue.*

2nd Sample.—Purchased of Harrington & Lucas, 74. Princes-street, Leicester-square.

Contains *a small quantity of* COPPER; solution of the ash tested with ammonia became of *a pale blue colour*, a *slight deposit of copper* taking place on a polished iron rod immersed in the acidulated solution of the ash. The fruit of a yellowish-olive colour, very different from that of the other samples.

3rd Sample.—Purchased of Sams & Co., 173. Piccadilly.

Contains *a very considerable quantity of* COPPER. An iron rod immersed in the fluid in which the fruit is preserved became *quickly covered with a thick deposit of copper.* Ash of a *deep but obscure pink* colour; solution of the ash treated with ammonia turned of a *deep blue.*

4th Sample.—Purchased of G. Neighbour & Sons, 149. Regent-street.

Contains *a small quantity of copper.* Ash *slightly pink;* solution of the ash treated with ammonia, *faint blue.* As viewed through the bottle, the olives in this sample appeared of a deep green colour, conveying the impression that they were highly coloured with copper. On removing them, however, from the bottle, they were seen to be of a dull yellowish-brown, and it then became evident that the green colour was entirely due to the intensely-coloured bottle.

Spanish Olives.

5th Sample.—Purchased of Hedges & Butler, 155. Regent-street.,

Not a trace of copper. Ash *white.* The olives in this case were of a fawn colour, without a tinge even of green. We believe that Spanish olives are generally sold in their natural state, and are almost invariably free from any contamination with copper. In the case of French olives the object appears to be to render them as green as possible; and this is effected by the free use of copper, as well as enclosing them in deep green bottles.

Limes.

6th Sample.—Purchased of J. Boyd, 59. Piccadilly. In bottle, labelled thus:

AUGUSTUS S. LEVY,
ENGLISH AND FOREIGN FRUITERER,
59. PICCADILLY.

Contains *a very small quantity of* COPPER. Ash *a little pink here and there.* Solution of the ash treated with ammonia became of *a faint blue* colour.

7th Sample.—Purchased of Fortnum & Mason, 182. Piccadilly.

Contains *a good deal of* COPPER. Ash of *a decided pink* colour; solution of the ash treated with ammonia, *light blue;* an iron rod immersed in the acidulated solution of the ash became *slightly coated with copper.*

large cells, resembling receptacles; next in order from without inwards is layer of small cells, deeply coloured; next to these succeed the cells which constitute the principal part of the seed; these for the most part resemble closely the cells of pepper, being very angular, but they differ in their more delicate and transparent appearance, and in being minutely dotted. *Fig.* 140. *B.*

Dr. Pereira, in his "Materia Medica," quotes the statement made by Schleiden that he has discovered in the cells of cardamom "amorphous, paste-like starch." We find the cells to be completely filled with minute, distinctly-formed starch-granules, resembling closely those of rice. Probably the statement of M. Schleiden arose from his having employed but a feeble magnifying power in the examination of the seeds.

The presence of cardamom seeds in curry-powder is most readily determined by means of the dotted and angular cells which form the substance of the seeds.

To the taste, cardamom seeds are sharp, warm, aromatic, and very like camphor. They contain both a fixed and volatile oil; but their chief properties are due to the presence of the latter.

Cummin Seeds.

The Cummin plant *(Cuminum Cyminum)* belongs, like Coriander, to the natural order Umbelliferæ; it is a native of Upper Egypt, but is extensively cultivated in Sicily and Malta.

Cummin seeds resemble somewhat caraway seeds, but they are larger, straighter, and of a lighter colour. The fruit is double, like that of coriander and all other umbelliferous plants, consisting of two seeds or mericarps; each mericarp has five *primary* ridges, which are filiform; and four *secondary* ridges, which are prominent; but both are furnished with very fine hairs or prickles, and under each secondary ridge is a receptacle or vitta.

Transverse sections of a cummin seed exhibit the following structure:—

The hairs or prickles are composed of cells, the long diameters of which are arranged in the long axes of the hairs. The husk or covering of the seed is made up of numerous rounded or angular cells, in the midst of which the large and triangular vittæ are situated; and between the husk and seed itself, there is usually a small space, which is formed by the contraction of the seed after it has arrived at maturity. The surface of the seed is of a pale brown colour, and its interior whitish and transparent. The exterior portion of the seed is constituted of elongated and flattened cells of a brownish colour, while the interior and chief substance of the seed itself is composed of numerous distinct, angular cells, the walls of which are thick and perfectly transparent; their contents consist principally of oil. The seeds do not contain starch. *Fig.* 141.

Cummin seeds possess a very peculiar, medicinal taste and smell, and it is to these that curry-powder owes the greater part of its characteristic flavour and odour.

Fœnugreck Seeds.

Fœnugreck seeds are the produce of *Trigonella Fœnum Græcum*, one of t family Leguminosæ, or pea-tribe.

It is an annual plant, bearing yellow flowers, and grows principally in Ind Arabia, Sicily, and Montpelier.

The taste of the ground seeds is peculiar, but at the same time raw, and som what like that of beans; it is to these seeds that the characteristic flavour curry-powder is in part due.

According to Mr. Gray, the seeds are used by the inhabitants of the E Indies in cases of dysentery, and by the Arabs as a poultice for wounds. England they are employed in veterinary medicine, but chiefly as an ingredi in curry-powder.

The seeds contain a large quantity of mucilage, and hence their infusion a decoction are demulcent.

The structure of Fœnugreck seeds is very characteristic. The husk of t seed consists of three membranes; the outer is formed of a single layer of cel which bear a remarkable resemblance in shape to a short-necked bottle; t

Y-FOUR SAMPLES OF PRESERVED BOTTLED LES.

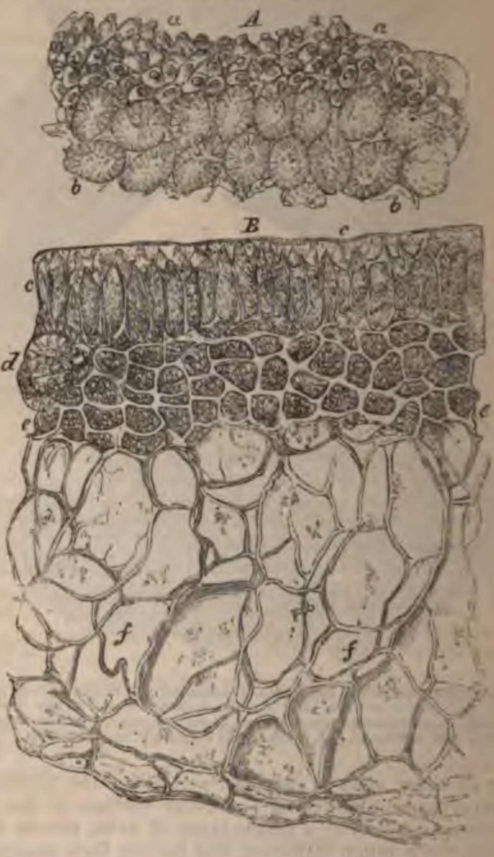
ice on on.	Colour of Ash.	Colour of Solution of Ash, treated with Ammonia.	Action of Acidulated Solution of Ash on Iron Rod.	COPPER.	
	Nearly white.	Faint blue.	None.	A trace.	1
	White.	None.	None.	None.	2
	White.	None.	None.	None.	3
	White.	None.	None.	None.	4
f copper.	Pink.	Decided blue.	Thick coating of copper.	Considerable.	5
of cop-	Pink.	Pale blue.	Coating of copper.	Considerable.	6
ating of	Deep pink.	Rich deep blue.	Very dense coating of copper.	Most of all.	7
	Somewhat pink.	Faint blue.	None.	Small quantity.	8
	Light pink.	Pale blue.	Coating of copper.	Considerable.	9
	White.	None.	None.	None.	10
of cop-	Rather deep pink.	Decided blue.	Dense coating of copper.	Very considerable.	11
of cop-	Rather deep pink.	Bright blue.	Thick coating of copper.	Very considerable.	12
of cop-	Rather deep pink.	Bright blue.	Thick coating of copper.	Very considerable.	13
of cop-	Decided pink.	Bright blue.	Very dense coating of copper.	Very considerable.	14
	Nearly white.	Very faint blue.	None.	A trace.	15
	Decided pink.	Light blue.	None.	Small quantity.	16
	Slightly pink here and there	Very faint blue.	None.	A trace.	17
	Delicate pink.	None.	None.	Very small quantity.	18
ating of	Deep, dirty pink.	Rich blue.	Very dense coating of copper.	Very large quantity.	19
of cop-	Deep obscure pink	Decided blue.	Very thick coating of copper.	Considerable.	20
of cop-	Obscure pink.	Decided blue.	Thick coating of copper.	Considerable.	21
	Somewhat pink.	Pale blue.	Slight coating of copper.	Small quantity.	22
of cop-	Deep obscure pink	Deep blue.	Very thick coating of copper.	Very considerable.	23
	Pink, scarcely perceptible.	Faint blue.	None.	A little.	24
	Brownish white.	None.	None.	None.	25
	Slightly pink.	Faint blue.	None.	Very small quantity.	26
	Rather deep pink.	Light blue.	Slight coating.	A good deal.	27
ating of	Rather deep pink.	Decided blue.	Very dense coating of copper.	Very considerable.	28
ating of	Deep pink.	Very decided blue.	Dense coating of copper.	Very large.	29
ting of r.	Decided pink.	Pale blue.	Thick coating of copper.	Considerable.	30
	White.	None.	None.	None.	31
	Decided pink.	Light blue.	Slight coating of copper.	A little.	32
opper.	Decided pink.	Decided blue.	Decided coating of copper.	Considerable.	33
	White.	None.	None.	None.	34

present. It is only when the quantity of iron detected is greatly above ordinarily contained in genuine curry-powder, that we can safely prono the sample to be adulterated with that metal.

Fig. 142.

OUTER COAT OR TESTA OF A FENUGRECK SEED.

(Magnified 220 diameters.)



A. Portion of the outer and second membrane stripped off; *a a*, peculiar bottle-like cells; *b b*, crenated cells of second membrane. *B*. Transverse section of husk of seed; *c c*, bottle-like cells; *d*, position of crenated cells; *e e*, layer of coloured cells merging into *f f*, the large cells which form the innermost membrane, filled with mucilage.

RESULTS OF THE MICROSCOPICAL AND CHEMICAL ANALYSIS OF TWENT SAMPLES OF

CURRY-POWDER,

PURCHASED AT THE ESTABLISHMENTS OF VARIOUS GROCERS AND OILMEN I METROPOLIS.

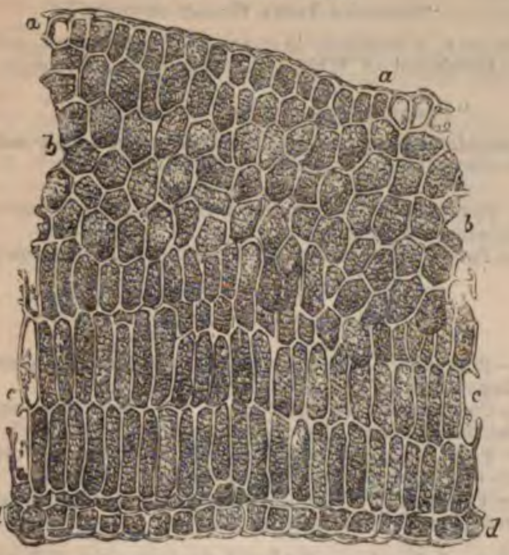
1st Sample.—Purchased of W. M. Nicholson, 86. Upper-street, Islington. *Contains* a small quantity of *salt*.

2nd Sample.—Purchased of Gluckner & King, 17. Mount-row, Islington. *Contains* very much *ground rice*.

Fig. 143.

TRANSVERSE SECTION OF LOBE OF FŒNUGRECK SEED.

(Magnified 220 diameters.)



a a. Layer of small angular cells on the surface. *b.* Rounded or angular cells. *c.* The same cells gradually becoming more elongated as they approach the inner part of lobe. *d.* Single row of cells forming the innermost margin of lobe.

3rd Sample.—Purchased of H. Davis & Co., 23. High-street, Islington.
Contains a proportion of *ground rice.*
4th Sample.—Purchased of C. Young, 8. High-street, Islington.
Genuine.
5th Sample.—Purchased of Beckett & Young, 3. High-street, Islington.
Genuine.
6th Sample.—Purchased of C. Roads, 11. Black Prince-row, Walworth.
Contains a proportion of *ground rice.*
7th Sample.—Purchased of W. Bourne, 109. Blackman-street, Borough.
Genuine, but consists principally of *turmeric-powder* and *cayenne.*
8th Sample.—Purchased of S. Jackson, 75. Blackman-street, Borough.
Contains a very small quantity of *salt.*
9th Sample.—Purchased of J. North, 135. High-street, Borough.
Contains a small proportion of *salt.*
10th Sample.—Purchased of Harrington and Lucas, 113. High-street, Borough.
Contains RED-LEAD and *salt.*
11th Sample.—Purchased of G. Pike, 77. High-street, Borough.
Contains very much *ground rice.*
12th Sample.—Purchased of Way & Co., 272. Oxford-street.
Contains a considerable quantity of RED-LEAD.
13th Sample.—Purchased of R. Drewe, 118. Tichfield-street.
Contains a considerable quantity of RED-LEAD, and a little *salt.*
14th Sample.—Purchased of J. Edwards, 10. Cambridge-street, Golden-square.
Genuine.
15th Sample.—Purchased of J. Bishopp, 51. Brewer-street, Golden-square.
Contains an immense quantity of *ground rice.*
16th Sample.—Purchased of R. C. Hall, 72. Princes-street, Leicester-square.
Contains RED-LEAD and a small quantity of *salt.*

intense a green as to impart to the fruit as seen through the bottle a deep green colour.

As a rule, the amount of copper ordinarily present in many kinds of bottled fruits and vegetables, is greater for even equal quantities than in pickles, which, as we some months since showed, also frequently contain that metal in large and almost poisonous quantity. Add to this the fact that while pickles are used in small quantity only, a whole bottle of preserved fruit is consumed by two or three persons at one time; hence we perceive how much more dangerous is the employment of copper in the case of fruits than in that of pickles.

The present adds another instance to the many which have already been adduced, in which manufacturers, in order to heighten the colour of articles, and as they conceive, often very erroneously, to preserve their appearance, have sacrificed their flavour and quality, and have risked health, and even safety.

" *To the Editor of* THE LANCET.

SIR, — Having taken considerable interest in the reports of the Analytical Sanitary Commission, I too have had my eyes opened to the necessity of watchfulness in the purchase of articles of food. Of this I will give you a late instance.

I had bought a bottle of preserved gooseberries from one of the most respectable grocers in this town, and had had its contents transferred into a pie. It struck me that the gooseberries looked fearfully green when cooked; and on eating one with a steel fork, its intense bitterness sent me in search of the sugar. After having sweetened and mashed the gooseberries with the same steel fork, I was about to convey some to my mouth, when I observed the prongs to be completely coated with a thin film of bright metallic copper. My testimony can be borne out by the evidence of three others, two of whom dined at my table.

It is a fortunate circumstance that, considering the frequent presence of copper in pickles and preserves, its detection is so easy. I hope you will excuse my troubling you.

I remain, Sir, yours respectfully,
ALBERT J. BERNAYS, F.C.S., &c.

Chemical Laboratory, Derby, Jan. 1853.

Our correspondent's communication is in many respects valuable, especially as showing the dangerous adulterations practised by the manufacturers of bottled fruits, and also the correctness of the Analytical Sanitary Commission; but it is deficient in the most important point — viz., Mr. Bernays has omitted to give the name of the party from whom the preserved gooseberries were procured. Why should all the respectable grocers in Derby be exposed to suspicion, because one of them has sold preserved gooseberries strongly impregnated with a poisonous solution? The name of the vendor should be published; and his integrity will not be impugned in the slightest degree, if he, in his turn, publishes the name and address of the manufacturer by whom he was supplied with the poisonous commodity. The publication of the names and addresses of the offending parties has been throughout the boldest feature of our Commission, and has excited for it universal attention and respect. — ED. L."

MESSRS. CROSSE AND BLACKWELL.

The following remarks appeared in THE LANCET recently, amongst Answers to Correspondents: —

" The samples were entirely free from copper. The practice referred to, of imparting to bottled and preserved fruits and vegetables a bright green colour by means of a poisonous salt of copper, still prevails extensively. Nothing can be more pernicious than this practice; it has, however, received a considerable check by the publication of the Reports of the Analytical Sanitary Commission on this subject. One firm we know, that of Messrs. Crosse and Blackwell, whose establishment is the most extensive of any engaged in this branch of h *Sample.*—Purchased of J. Christmas, 34. South Audley-street. Sold as the vinegar of

MESSRS. BEAUFOY & CO.
VINEGAR MAKERS,
NINE ELMS.

Contains an *immense quantity of sulphuric acid.* 1000 grains yield 40·12 grains of *acetic acid*, or 4·01 *per cent.*, and 4·02 of *sulphuric acid.*

Sample.—Purchased of R. & C. Faulkner, 44. Jermyn-street. Sold as the vinegar of

MESSRS. POTTS & CO.,
VINEGAR MAKERS,
BRIDGE-STREET, SOUTHWARK.

Contains a *very small quantity of sulphuric acid.* 1000 grains yield 48·33 grains of *acetic acid*, or 4·83 *per cent.*, and ·63 of *sulphuric acid.*

Sample.—Purchased of T. Wood, Bridge-terrace, Harrow-road. Sold as the vinegar of

MESSRS. POTTS & CO.,
VINEGAR MAKERS,
BRIDGE-STREET, SOUTHWARK.

Contains a *very small quantity of sulphuric acid.* 1000 grains yield 48·33 grains of *acetic acid*, or 4·83 *per cent.*, and ·63 of *sulphuric acid.*

Sample.—Purchased of E. Price, 45. Coleshill-street, Pimlico. Sold as the vinegar of

MESSRS. GRIMBLE, PODMORE, & CO.,
VINEGAR MAKERS,
No. 1. NORTH-PLACE, ALBANY-STREET.

Contains *a very considerable quantity of sulphuric acid.* 1000 grains yield 41·99 grains of *acetic acid*, or 4·19 *per cent.*, and 1·86 of *sulphuric acid.*

Sample.—Purchased of S. Hardstaffe, 114. Edgware-road. Sold as the vinegar of

MESSRS. GRIMBLE, PODMORE, & CO.,
VINEGAR MAKERS,
No. 1, NORTH-PLACE, ALBANY-STREET.

Contains *an immense quantity of sulphuric acid.* 1000 grains yield 27·63 grains of *acetic acid*, or 2·76 *per cent.*, and 4·13 of *sulphuric acid.*

th Sample.—Purchased of G. Mills, 124. Edgware-road. Sold as the vinegar of

CHAMPION & CO.,
VINEGAR MAKERS,
OLD-STREET-ROAD.

Contains *a very considerable quantity of sulphuric acid.* 1000 grains yield 39·40 grains of *acetic acid*, or 3·94 *per cent.*, and 2·04 of *sulphuric acid.*

1*th Sample.*—Purchased of W. Hudson, 16. Crawford-street, Bryanston-square. Sold as the vinegar of

CHAMPION & CO.,
VINEGAR MAKERS,
OLD-STREET-ROAD.

Contains *a very considerable quantity of sulphuric acid.* 1000 grains yield 43·29 grains of *acetic acid*, or 4·32 *per cent.*, and 2·00 of *sulphuric acid.*

2*th Sample.*—Purchased of F. Tuck, 138. St. Alban's-place, Edgware-road. Sold as the vinegar of

MESSRS. HILLS & UNDERWOOD,
VINEGAR MAKERS,
NORWICH.

Does not contain free sulphuric acid. 1000 grains yield 56·38 grains of *acetic acid*, or 5·63 *per cent.*, and ·44 of *combined sulphuric acid.*

3*th Sample.*—Purchased of J. Hopkinson, 132. High Holborn. Sold as the vinegar of

There is little question, therefore, but that, in the majority of cases, the following analyses represent the actual qualities and condition of the vinegars of the several manufacturers by whom London is suppled. The samples were not procured direct from the makers, because of the difficulty experienced in obtaining them by parties not engaged in the trade.

The same ingenious system as that pointed out above, prevails in the article mustard. The manufacturer of this prepares three different qualities—double superfine, superfine, and fine—which may be thus characterised: most flour and turmeric, and a little mustard; still more flour and turmeric, and less mustard; nearly all flour and turmeric, with scarcely any mustard.

In our first Report on Vinegar, the quantity of sulphate of baryta thrown down, on the addition of chloride of barium, was determined in the following manner:—

The precipitate was collected on a filter, both being afterwards burned in a platinum crucible, to get rid of the organic matter, and the residue weighed, the previously ascertained weight of the ash left by the filter being deducted.

In the present case, the precipitates were obtained by decantation; after being once or twice washed with distilled water, they were dried in a glass capsule, and their weight taken. This method is both more simple and perhaps more accurate, the only objection to it being, that, in some instances, the precipitate requires many hours fully to subside, in consequence of a portion being held in suspension by the organic matter contained in the vinegar.

RESULTS OF THE CHEMICAL EXAMINATION OF TWENTY-EIGHT SAMPLES PURPORTING TO BE FROM THE VINEGARS OF THE DIFFERENT MAKERS AND MERCHANTS BY WHOM LONDON AND ITS SUBURBS ARE SUPPLIED, AND AS PROCURED FROM VARIOUS GROCERS, PUBLICANS, AND OILMEN.

1st Sample.—Purchased of J. Owtram, 6. Connaught-terrace, Edgware-road. Sold as the vinegar of

R. BURNETT & CO.,
Vinegar Makers,
Vauxhall.

Contains a *considerable quantity of sulphuric acid.* 1000 grains by measure of this vinegar yield 54·46 grains of *acetic acid*, or 5·44 *per cent.*, and 1·44 of *monohydrated sulphuric acid.*

2nd Sample.—Purchased of J. C. Holden, 48. Cambridge-street, Hyde-park-square. Sold as the vinegar of

R. BURNETT & CO.
Vinegar Makers,
Vauxhall.

Contains a *considerable quantity of sulphuric acid.* 1000 grains yield 50·50 grains of *acetic acid*, or 5·05 *per cent.*, and 1·54 of *sulphuric acid.*

3rd Sample.—Purchased of W. Fontaine, 10. Vere-street, Clare-market. Sold as the vinegar of

R. BURNETT & CO.,
Vinegar Makers,
Vauxhall.

Contains a *considerable quantity of sulphuric acid.* 1000 grains yield 51·84 grains of *acetic acid*, or 5·18 *per cent.*, and 1·60 of *sulphuric acid.*

4th Sample.—Purchased of E. Chappell, 1. Ranelagh-terrace, Pimlico. Sold as the vinegar of

MESSRS. BEAUFOY & CO.,
Vinegar Makers,
Nine Elms.

Contains an *immense quantity of sulphuric acid.* 1000 grains yield 35·13 grains of *acetic acid*, or 3·51 *per cent.* and 4·00 of *sulphuric acid.*

Sample. — Purchased of Mr. Hughes, 12. King-street, St. James's. Sold in bottle, and labelled

ROYAL STANDARD VINEGAR,
Manufactured entirely from
MALT,

nd highly recommended for its purity and strength. Stated to have been sold by

MESSRS. BULL & AMBLER,
VINEGAR MERCHANTS, BILLITER-STREET.

Contains *an enormous quantity of sulphuric acid.* 1000 grains yield 44·13 grains of *acetic acid*, or 4·41 *per cent.*, and 6·02 of *sulphuric acid.*

t Sample. — Purchased of J. Holmes, 180. Brick-lane, Whitechapel. Sold as the vinegar of

MESSRS. BUMSTEAD & Co.,
VINEGAR MERCHANTS, 86. LOWER THAMES-STREET.

Contains *a very considerable quantity of sulphuric acid.* 1000 grains yield 34·40 grains of *acetic acid*, or 3·44 *per cent.*, and 2·60 of *sulphuric acid.*

From information we have received, we believe that this vinegar, as also that the succeeding sample, was made by Mr PANTER, of Bristol.

ed Sample.— Purchased of F. Duckett, 18. High-street, Kensington; and sold as the vinegar of

MESSRS. BUMSTEAD & Co.,
VINEGAR MERCHANTS, 86. LOWER THAMES-STREET.

Contains *a very considerable quantity of sulphuric acid.* 1000 grains yield 38·65 grains of *acetic acid*, or 3·86 *per cent.*, and 2·31 of *sulphuric acid.*

d Sample. — Purchased of Mr. Moore, Hickman's-folly, Dock-head, Bermondsey. Sold as the vinegar of

MESSRS. TAYLOR,
VINEGAR MAKERS, LONG-LANE, BERMONDSEY.

Contains a *very considerable quantity of sulphuric acid.* 1000 grains yield 40·60 grains of *acetic acid*, or 4·06 *per cent.*, and 1·90 of *sulphuric acid.*

th Sample. — Purchased of Mr. Messent, 42. St. George's-street, Ratcliffe-highway. Sold as the vinegar of

MESSRS. TAYLOR,
VINEGAR MAKERS, LONG-LANE, BERMONDSEY.

Contains a *very considerable quantity of sulphuric acid.* 1000 grains yield 51·56 grains of *acetic acid*, or 5·15 *per cent.*, and 2·39 of *sulphuric acid.*

5th Sample. — Purchased of G. Pike, 77. High-street, Borough. Sold as the vinegar of

MESSRS. PAYNE & SLEE,
VINEGAR MAKERS, 6. CHURCH-STREET, HORSLEYDOWN.

Contains *an enormous quantity of sulphuric acid.* 1000 grains yield 32·74 grains of *acetic acid*, or 3·27 *per cent.*, and 5·51 of *sulphuric acid.*

6th Sample. — Purchased of W. Ingram, Broadway, Hammersmith. Sold as the vinegar of

MESSRS. PAYNE & SLEE,
VINEGAR MAKERS, 6. CHURCH-STREET, HORSLEYDOWN.

Contains *an immense quantity of sulphuric acid.* 1000 grains yield 46·72 grains of *acetic acid*, or 4·67 *per cent.*, and 3·88 of *sulphuric acid.*

MESSRS. HILLS & UNDERWOOD,
VINEGAR MAKERS,
NORWICH.

Does not contain free sulphuric acid. 1000 grains yield 56·66 grains of acetic *acid*, or 5·66 *per cent.*, and 0·38 of *combined sulphuric acid.*

14*th Sample.*—Purchased of J. Leigh, 122. Whitechapel-road. Sold as the vinegar of

MESSRS. HILL, EVANS, & CO.,
VINEGAR MAKERS,
WORCESTER.

Does not contain free sulphuric acid. 1000 grains yield 51·84 grains of acetic *acid*, or 5·18 *per cent.*, and *combined sulphuric acid*, as stated below.

15*th Sample.*—Purchased of J. Swinge, 3. Arbour-terrace, Commercial-road East. Sold as the vinegar of

MESSRS. HILL, EVANS, & CO.,
VINEGAR MAKERS,
WORCESTER.

Does not contain free sulphuric acid. 1000 grains yield 33·57 grains of acetic *acid*, or 3·35 *per cent.*, and *combined sulphuric acid*, as stated below.

16*th Sample.*—Purchased of C. Batty, Grand Junction-terrace, Edgware-road. Sold as the vinegar of

MESSRS. HILL, EVANS, & CO.,
VINEGAR MAKERS,
WORCESTER.

Does not contain free sulphuric acid. 1000 grains yield 49·24 grains of acetic *acid*, or 4·92 *per cent.*, and *combined sulphuric acid*, as stated below.

The vinegars of Messrs Hill, Evans, & Co. have been recently analysed by Professors Graham, Hofmann, and Playfair. The quantity of *combined* sulphuric acid given in their analyses ranged from 1·23 to 1·33: this is derived from the grain and well-water used, but principally from the latter, which contains a considerable quantity of sulphate of lime, in which respect it is like the Burton water, only that the quantity of lime is greater.

17*th Sample.*—Purchased of Messrs. Smith and Tyers, Vinegar Merchants, High-street, Borough. Sold as the vinegar of

MR. J. P. OSBORNE,
VINEGAR MAKER,
COLCHESTER.

Contains *a very considerable quantity of sulphuric acid.* 1000 grains yield 44·77 grains of *acetic acid*, or 4·47 *per cent.*, and 2·41 of *sulphuric acid.*

18*th Sample.*—Purchased of W. Fontaine, 10. Vere-street, Clare-market. Sold as

COUNTRY VINEGAR.

Contains *an immense quantity of sulphuric acid.* 1000 grains yield 35·19 grains of *acetic acid*, 3·51 *per cent.*, and 3·65 of *sulphuric acid.*

From inquiries made, we believe that this vinegar, as also that of the two succeeding samples, were made by Mr. OSBORNE, of Colchester.

19*th Sample.*—Purchased of W. Fontaine, 55. High-street, Whitechapel. Sold as

COUNTRY VINEGAR.

Contains *a very considerable quantity of sulphuric acid.* 1000 grains yield 52·33 grains of *acetic acid*, or 5·23 *per cent.*, and 2·60 of *sulphuric acid.*

TABLE II.

showing the Amount of Sulphuric Acid present in the several Samples, arranged in order from the lowest to the highest.

Retailers.	Makers.	Monohydrated Sulphuric Acid or Vitriol in 1000 grains.
J. Hopkinson.	Hills & Underwood.	None.
F. Tuck.	Ditto.	None.
Mr. Portch.	Swann & Co.	None.
Warton and Co.	Ditto.	None.
J. Leigh.	Hill, Evans, & Co.	None.
J. Swinge.	Ditto.	None.
C. Batty.	Ditto.	None.
R. & C. Faulkner.	Potts & Co.	A very small quantity - - ·63
T. Wood.	Ditto.	Ditto - - - ·63
J. Owtram.	Burnett & Co.	Considerable - - 1·44
J. C. Holden.	Ditto.	Ditto - - - 1·54
W. Fontaine.	Ditto.	Ditto - - - 1·60
E. Price.	Grimble & Podmore.	Very considerable - - 1·86
Mr. Moore.	Taylor & Co.	Ditto - - - 1·90
W. Hudson.	Champion & Co.	Ditto - - - 2·00
G. Mills.	Ditto.	Ditto - - - 2·04
F. Duckett.	Panter & Co.	Ditto - - - 2·31
Mr. Messent.	Taylor & Co.	Ditto - - - 2·39
Smith and Tyers.	J. P. Osborne.	Ditto - - - 2·41
J. Holmes.	Panter & Co.	Ditto - - - 2·60
W. Fontaine.	J. P. Osborne.	Ditto - - - 2·60
W. Fontaine.	J. P. Osborne.	An immense quantity - - 3·65
W. Ingram.	Payne & Slee.	Ditto - - - 3·88
E. Chappell.	Beaufoy & Co.	Ditto - - - 4·00
J. Christmas.	Ditto.	Ditto - - - 4·02
S. Hardstaffe.	Champion & Co.	Ditto - - - 4·12
G. Pike.	Payne & Slee.	Ditto - - - 5·51
W. Hughes.	J. P. Osborne.	An enormous quantity - - 6·02

TABLE III.

showing the Amount of Acetic Acid present in the several Samples, arranged in order from the highest to the lowest.

Retailers.	Makers.	Acetic Acid in 1000 grains.	Acetic Acid per cent.
J. Hopkinson.	Hills & Underwood.	56·66	5·66
F. Tuck.	Ditto.	56·38	5·63
J. Owtram.	Burnett & Co.	54·46	5·44
W. Fontaine.	J. P. Osborne.	52·33	5·23
W. Fontaine.	Burnett & Co.	51·84	5·18
J. Leigh.	Hill, Evans, & Co.	51·84	5·18
Mr. Messent.	Taylor & Co.	51·56	5·15
J. C. Holden.	Burnett & Co.	50·50	5·05
C. Batty.	Hill, Evans, & Co.	49·24	4·92
R. C. Faulkner.	Potts & Co.	48·33	4·83
J. Wood.	Ditto.	48·33	4·83
Mr. Portch.	Swann & Co.	47·70	4·77
Mr. Ingram.	Payne & Slee.	46·72	4·67
Warton and Co.	Swann & Co.	45·87	4·58
Smith and Tyers.	J. P. Osborne.	44·77	4·47
W. Hughes.	Ditto.	44·13	4·41
W. Hudson.	Champion & Co.	43·29	4·32
E. Price.	Grimble & Podmore.	41·99	4·19
Mr. Moore.	Taylor & Co.	40·60	4·06
J. Christmas.	Beaufoy & Co.	40·12	4·01
G. Mills.	Champion & Co.	39·40	3·94
F. Duckett.	Panter & Co.	38·65	3·86
W. Fontaine.	J. P. Osborne.	35·19	3·51
E. Chappell.	Beaufoy & Co.	35·13	3·51
J. Holmes.	Panter & Co.	34·40	3·44
J. Swinge.	Hill, Evans, & Co.	33·57	3·35
G. Pike.	Payne & Slee.	32·74	3·27
S. Hardstaffe.	Grimble & Podmore.	27·63	2·76

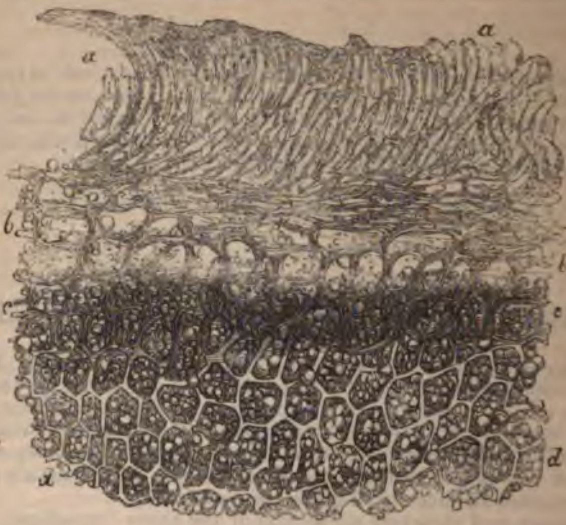
ould be particularly observed, that the above Table gives no clue to the h of the different qualities of the vinegars manufactured by the several , but simply shows that vinegar, as retailed to the public, is subject to rable variation of strength. The manufacturers, as already described, t several qualities of vinegar, and it was not stated by the sellers in the cases what the professed quality of the vinegars sold by them was, so some of the instances given, it may have been the inferior number or h, and in others the highest.

an examination of the preceding Tables of Analysis the following results deduced :—

Fig. 139.

TRANSVERSE SECTION OF MERICARP OF CORIANDER.

(Magnified 220 diameters.)



a a. Fibres forming the husk. *b.* The loose cells which unite the husk to the seed. *c.* The layer of deeply-coloured cells, in contact with the seed. *d d.* Cells composing the seed itself.

CARDAMOM SEEDS.

There are several species of cardamom; but the true or officinal species is the *Elettaria Cardamomum*, one of the natural order Zingiberaceæ.

It is a native of the mountainous parts of the coast of Malabar; in some localities the plant in its wild state yields cardamoms fit for use, but those which are cultivated are the best.

According to Mr. White*, the spots chosen for the cardamom farms are called *Ela-Kandy*, and are either level or gently sloping surfaces on the highest ranges of the Ghaûts, after passing the first declivity from their base. "Before the commencement of the periodical rains, in June, the cultivators of the cardamom ascend the coldest and most shady sides of a woody mountain; a tree of uncommon size and weight is then sought after, the adjacent spot is cleared of weeds, and the tree felled close at its root. The earth, shaken and loosened by the force of the fallen tree, shoots forth young cardamom plants in about a month's time."†

There are three varieties of Malabar cardamoms distinguished in commerce, which are named from the size and form of the seed-pod, *shorts*, *short-longs*, and *long-longs*,—the shorts being the most esteemed variety; the two latter differ from each other in size only.

"The three sorts are brought from Bombay in chests. The shorts are usually the dearest, and fetch from 3*d.* to 6*d.* per pound more than the longs. The long-longs are seldom brought over. From Madras, only long cardamoms (usually short-longs, rarely long-longs) are brought; they are generally packed in bags, and are lighter by weight than the Bombay sort, and usually fetch 3*d.* per pound less than the latter."‡

Cardamom pods are of a triangular form, and consist of three valves, tapering

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* Transactions of Linnæan Society, vol. x. p. 237.

† Captain Dickson, in Roxburgh's *Fl. Indica.*

‡ Pereira's Materia Medica, third edition, vol. ii. part i. p. 1144.

few weeks ago I had a young vinegar-plant sent me, with the following
ons:—'Put the plant in an earthen jar, add to it half a pound of the
st most sugar, and half a pound of treacle, with five pints of milk-warm
cover it lightly over, so as to keep out the dust, but not the air, and then
in a moderately warm place; there let it remain seven weeks, not dis-
g it more than you can help. At the end of that time pour off what is
e clear vinegar, and keep it in well-corked bottles for use. Again add
plant the same quantity of water, sugar, and treacle, as before. At the
the second seven weeks, the plant will have become like two thick pan-
and they may be easily divided, care being taken not to tear the old or
lant. If the plant is exposed to the cold, or kept too long out of the
it will become black and die.'

herewith send you," continues Mr. Fletcher, "a sample of vinegar thus
ictured. Should the sample be worthy of your attention, I will send you
r quantity of vinegar, a young plant, and a sample of pickles made with
nd of vinegar."

second letter, Mr. Fletcher writes: "The plant I have, was given me
n the winter, and it not only has supplied me with several young plants
nds, but vinegar enough to last me for years."

The Vinegar of Messrs. Champion and Co.

To the Editor of The Lancet.

r,—Our attention has just been called by our travellers, who report the
several orders in consequence of a most gross libel published in your
f the 28th of August last, in stating in your No. 2. table, Vinegar Analyses,
negar bought of a Mr. Hardstaffe, and represented to contain 4·12 sulph.
as vinegar made by Champion & Co. We beg to state, we never supplied,
we know the party; and we must hold your responsible for all loss we
stain by your giving publicity to a charge so utterly false and unfounded

ving been thus necessitated to address you, we feel ourselves in some
e compelled to notice your statement in other respects, so far as it refers
gar made by Champion & Co., and which we shall do by simply stating,
is equally incorrect and groundless in its premises, and unfounded in fact.

We are, sir, yours respectfully,

Widow Champion & Co."

14, 1852."

ought, being under the government of our most gracious lady the Queen,
ertain great respect for the ladies, and for female authority; we shall
re not reply to the rather angry note of Mrs. Champion in any harsh or
terms. If this lady-manufacturer will take the trouble to look at the
ed analyses, she will perceive it is not even stated that any sample of
egar was purchased of Mr. Hardstaffe. In Table 2., it should be "Grim-
l Podmore," in place of Champion & Co., which is a mere misprint, as is
shown by the analysis and the other tables. The tables, with the ex-
of such a misprint as that pointed out to our notice by Widow Champion
are mere compilations from the analyses.

ANCHOVIES, THEIR SUBSTITUTIONS AND ADULTERATIONS.

nd but little in works on the adulteration of food, in reference to the
ution of inferior kinds of fish for this much-esteemed variety; although,
non report is to be credited, but few articles of consumption are more
to substitution and adulteration than the anchovy, whether in the entire
r in the form of paste and sauce.

he present occasion, we have to treat of the entire fish. The only ob-
ons with which we are acquainted, relating to this are the following:—

TABLE SHOWING THE RESULTS OF THE CHEMICAL AN FRUI

	Name.	Fruit or Vegetables.	Colour previous to Cooking.	Colour whe
1	T. Snelling.	Red currants.	Natural.	Natur
2	E. Fenning.	Raspberries and Currants.	Natural.	Natur
3	Crosse and Blackwell.	Ditto ditto.	Natural.	Natur
4	Crosse and Blackwell.	Cherries.	Natural.	Natur
5	G. Whybrow and Co.	Gooseberries.	Unnaturally green.	Deep bluis
6	T. Snelling.	Ditto.	Grassy green.	Coppery
7	E. Fenning.	Ditto.	Unnaturally green.	Coppery
8	E. and J. Freeman.	Ditto.	Dull, unnatural green.	Bluish g
9	Crosse and Blackwell.	Ditto.	Grassy green.	Coppery
10	Castell and Brown.	Ditto.	Natural.	Natur.
11	G. Whybrow.	Greengages.	Very unnaturally green.	Deep coppe
12	Crosse and Blackwell.	Ditto	Unnaturally green.	Deep coppe
13	E. Lazenby.	Ditto.	Unnaturally green.	Deep coppe
14	R. and C. Faulkner.	Ditto.	Very unnaturally green.	Deep coppe
15	Hedges and Butler.	Ditto.	Natural.	Natur
16	Fortnum and Mason.	Ditto.	Rather too green.	Rather to
17	Castell and Brown.	Ditto.	Natural.	Natur
18	Howis and Masson.	Ditto.	Natural.	Natur
19	J. Willmott and Co.	French Olives.	Unnaturally green.	. .
20	Burgess and Son.	Ditto.	Unnaturally green.	. .
21	C. Wix and Sons.	Ditto.	Unnaturally green.	. .
22	Harrington and Lucas.	Ditto.	Olive yellowish green.	. .
23	Sams and Co.	Ditto.	Unnaturally green.	. .
24	Neighbour and Sons.	Ditto.	Natural.	. .
25	Hedges and Butler.	Spanish Olives.	Natural.	. .
26	A. S. Levy.	Limes.	Intense olive-green.	. .
27	Fortnum and Mason.	Ditto.	Deep green.	. .
28	Batty and Feist.	Rhubarb.	Very unnaturally green.	Deep coppe
29	Westbrooke and Co.	Ditto.	Unnaturally green.	Very deep cop
30	Russell and Co.	Ditto.	Unnaturally green.	Coppery
31	Castell and Brown.	Ditto.	Natural.	Yellowis
32	J. Willmott and Co.	Rhubarb & Gooseberries.	Unnaturally green.	Coppery
33	J. Wingrave.	Ditto ditto.	Unnaturally green.	Coppery
34	Joseph Colin.	Peas.	Very yellow.	Very ye

el. In the Appendix to Willughby's work, it is mentioned as having iken on the coast of Wales; Pennant obtained it near his own residence, ning, in Flintshire; and Mr. Bicheno has very recently obtained several coast of Glamorganshire. It is said to be sold frequently in Liverpool , and is reported to be at this time an inhabitant of the piece of water Blackwall, called Dagenhall Breach.

range to the north is extensive, as it is occasionally taken in the Baltic, the coast of Norway; but is not included by Linnæus in his *Fauna* z.

e anchovy appears to attain a much larger size than has usually been d to it: from four to five inches in length is the more ordinary size; r. Couch says, 'I have seen it in the Cornish seas of the length of nches and a half; and I have met with specimens from autumn, through nter, to the middle of March. It is therefore probable that a fishery be established with good prospect of success, for though the nets employed er fish can take but few of them, the numbers found in the stomachs whiting, and other ravenous fishes, show that they are in considerable nce.

e anchovy is immediately recognised among the species of the family to it belongs by its sharp-pointed head, with the upper jaw considerably gest. The length of the head, compared with the length of the body is as one to three; the depth of the body but two-thirds of the length head, and compared to the length of the whole fish, is as one to seven; the y of the dorsal fin arises half-way between the point of the nose and the the fleshy portion of the tail; the third ray of the dorsal fin, which is gest, is of the same length as the base of the fin; the pectoral fin small; tral fins arise in a vertical line in advance of the commencement of the fin, which is over the space between the ventral and anal fins; the base anal fin is as long as the distance from its commencement to the origin ventral fins; the rays short; the tail deeply forked. The fin rays in r are—

D, 14; P, 15; V, 7; A, 18; C, 19.

readth of the eye is one-fifth of the length of the whole head; the rity in the comparative length of the jaws has been previously noticed; l-covers are elongated; the scales of the body large and deciduous; the of the top of the head and back blue, with a tinge of green; irides, gill-sides, and belly, silvery white; the fins delicate in structure, and greenish the membranes connecting the rays almost transparent.

a series of notes on the occurrence of rare fish at Yarmouth and its ,, with which I have been favoured by Dawson Turner, Esq., there is n of a specimen of the anchovy, taken on the beach, which measured six and a half in length; an additional proof of the large size acquired by this our shores."

he above we would add a description of the condition of the true anchovy ottled.

head and intestines are removed; the scales and fins, with the exception the pectorals, are allowed to remain; the fish is of small size, silvery, her flat, the line of the back slightly curved, and the flesh is usually of a r salmon colour, the depth varying considerably in different samples ing to age; if an anchovy be three months old, it will be pale, if six months, pink, and if twelve months, a beautiful deep pink colour.

number of the fin-rays, which may be counted in the fish in its preserved is greater than that given in the description we have quoted; thus, when te, the dorsal fin is composed of sixteen rays, the anal fin of nineteen, and dal of twenty-six rays.

hovies are imported in barrels preserved in brine, made with rock salt; tling is performed in this country, chiefly by the wholesale pickle and ce makers.

17th Sample.—Purchased of G. Mills, 33. South Molton-street.
Genuine, but contains a small quantity of *powdered cassia.*

18th Sample.—Purchased of W. J. Brown, 12. High-Street, Islington. In package, labelled

"GENUINE INDIA CURRY-POWDER."

Contains RED-LEAD, a considerable quantity of *potato-flour*, and much salt.

19th Sample.—Purchased of White & Fairchild, 63. Borough. In package labelled

"SCHAH SOOJAH INDIA CURRY-POWDER."

Contains a considerable quantity of *ground rice*, and a little *salt*.

20th Sample.—Purchased of Fortnum & Mason, Piccadilly.
Genuine.

21st Sample.—Purchased of S. Dummer & Co., 14. Marylebone-street.
Contains very much RED-LEAD.

22nd Sample.—Purchased of Robinson, Piccadilly. In package labelled

"CAPTAIN WHITE'S CURRY-POWDER,
(Originally called SELIM'S.)"

Genuine.

23rd Sample.—Purchased of Bardsley & Co., 103. Tottenham-court-road.
Contains a large quantity of *ground rice.*

24th Sample.—Purchased of Andrews & Co., 107. Tottenham-court-road.
Contains a considerable quantity of RED-LEAD.

25th Sample.—Purchased of Salmon & Co., 69. Tottenham-court-road.
Contains RED-LEAD and a very large quantity of *ground rice.*

26th Sample.—Purchased of W. Gilbert, 92. Tottenham-court-road.
Contains a considerable quantity of *ground rice.*

From a review of the above Table of Analyses, the following conclusions may be deduced:—

Of the *twenty-six* samples of curry-powder submitted to microscopical and chemical examination,

1st. That *seven* only were *genuine.*
2nd. That *nineteen*, or nearly four-fifths were *adulterated.*
3rd. That *ground rice*, usually in very large quantities, was present in *nine* samples.
4th. That *potato-farina* was detected in *one* sample.
5th. That *salt* was present in *eight* of the samples.
6th. That the highly poisonous metallic oxide, RED-LEAD, was detected in no less than *eight* of the samples.
7th. That in *seven* of the samples, the adulteration consisted of *ground rice* only.
8th. That in *one* sample, the adulteration consisted of *ground rice* and *salt.*
9th. That in *one* sample, the adulteration consisted of *ground-rice* and RED-LEAD.
10th. That in *three* samples, the admixture consisted of *salt only.*
11th. That in *three* samples, the adulteration consisted of *salt* and RED-LEAD.
12th. That in *three* samples the adulteration consisted of RED-LED only.
13th. That in *one* sample, the adulteration consisted of RED-LEAD in combination with *potato-farina* and *salt.*

The above results do not give the whole of the adulterations to which the twenty-six samples have been subjected, since they do not include the FERRUGINOUS EARTHS, which were shown, in our article on Cayenne, to be so frequently employed to impart colour to that substance. In consequence of the large and variable quantity of iron present in genuine curry-powder, it is not easy accurately to determine in what cases that metal exists in excess. The ferruginous earths consist of alumina, in combination with a small and variable amount of iron in the condition of red oxide.

We have thus shown that curry-powder is adulterated to nearly the same extent, and frequently with ingredients equally pernicious, as the subject of our last report, namely, cayenne.

mple.—Purchased of Crosse & Blackwell, 21. Soho-square. In small
ong square bottle. Price 1*s.*
coloured with a small quantity of red earth, resembling *bole Armenian.*
mple.—Purchased of Fortnum & Mason, 182. Piccadilly. In square
tle. Price 1*s.* 6*d.*
very highly coloured with a large quantity of red earth, resembling
Armenian, which is visible at the bottom of the bottle as a dense pre-
itate.
mple.—Purchased of Hedges & Butler, 155. Regent-street. In square
tle. Price 2*s.* 6*d.*
decidedly coloured with a reddish earth, probably *bole Armenian.*
mple.—Purchased of J. Wilson, 5. Oxford-street. In glass barrel.
ce 9*d.*
sts entirely of Dutch fish; the fish, as well as the brine, intensely
oured with an immense quantity of red earth, resembling *Venetian red.*
mple.—Purchased of J. P. R. Jacquet, 25. James-street, Covent-garden.
glass barrel. Price 7½*d.*
isting entirely of Dutch fish; the brine, as also the fish, being highly
oured with a large quantity of red earth, similar to *bole Armenian.*
mple.—Purchased of E. Lazenby, 6. Edwards-street, Portman-square.
octagonal bottle. Price 1*s.* 6*d.*
highly coloured with much earth, of a reddish-brown colour, probably
e Armenian.
mple.—Purchased of E. & J. Freeman, 3. Wigmore-street. In square
tle. Price 1*s.* 6*d.*
decidedly coloured with red earth, resembling *bole Armenian.*
mple.—Purchased of Russell & Co., King-street, Covent-garden. In
ss barrel. Price 10*d.*
isting entirely of Dutch fish; brine highly coloured with *bole Armenian.*

Loose Anchovies.

mple.—Purchased of W. Nixey, 22. Moor-street, Soho.
ists entirely of Dutch fish; brine of a dirty brown colour, but does not
tain *bole Armenian*, nor any other ferruginous earth.
mple.—Purchased of C. Crames, Lisle-street, Leicester-square.
of a brown colour; but does not contain *bole Armenian*, or any other
ruginous earth.
mple.—Purchased of T. Caplin, 6. Brewer-street, Golden-square.
and fish very highly coloured with an immense quantity of red earth,
ilar to *Venetian red*, which forms a dense precipitate at the bottom of
jar.
mple.—Purchased of J. Levy, 3. Crown-street, Soho.
ists entirely of Dutch fish; brine does not contain red earthy colouring
tter.
mple.—Purchased of Mr. Green, 32. Little Newport-street.
of a dirty brown colour, but does not contain *bole Armenian*, nor any
er ferruginous earth.
mple.—Purchased of W. Gilbert, 31. King-street, Golden-square.
, as well as the fish, very deeply coloured with a large quantity of reddish-
wn earth, probably *bole Armenian.*

an examination of the above Table of Analyses it appears:—

at *seven* of the samples consisted entirely of Dutch fish.
hat *two* of the samples consisted of a mixture of Dutch fish and
ovies.
at the brine in *twenty-three* of the samples was charged with either *bole*
nian or *Venetian red*, the quantity varying considerably in amount, but
st cases the brine was saturated with these earthy powders to such an
t that they might be obtained and collected from the bottom of the
s almost by tea-spoonfuls.

not to be inferred that those samples in which no Dutch fish were de-
consisted of the true anchovy, since we have ascertained that two other

the green colour of fruits and vegetables, has already been remarked upon in the Report on Pickles. This action is exerted upon the green contents of the cells, the chlorophylle, and hence it is the coloured portions of vegetables and fruits, as those invested by the epidermis, which are most affected by this substance. The copper used accumulates in this membrane as a salt, as an acetate, a citrate, or a malate of copper.

The presence of copper, however, in fruits and vegetables is not confined to the coloured portions; it penetrates through the whole tissue, and a considerable part of the metal used even remains diffused throughout the fluid in which the vegetable substance is contained: hence it is desirable to analyse for copper not only the preserved article itself, but also the fluid in which it is immersed.

The processes for examination adopted in the subjoined analyses were as follows:—

First. About three ounces of the juice or fluid in which the fruit or vegetable was preserved were measured out, placed in a test-glass, and the acidity having been slightly increased by the addition of about three drops of strong nitric acid, a polished rod of iron was placed in the fluid, and allowed to remain for about twenty-four hours. If copper was present in considerable amount, the surface of the rod, from top to bottom, became covered with a continuous and bright coating of that metal. If the amount of copper was less considerable, the upper half or so only of the rod received the coating. If the quantity was very small indeed, no perceptible deposit of copper took place.

Hence we perceive that the iron rod affords a simple and most conclusive test for copper in fruits and vegetables, when present in anything like considerable amount; and that it even serves to indicate, to a certain extent, the quantity of copper with which the juice of different samples is impregnated, as shown by the rapidity with which the deposit occurs, by the thickness of the coating, and by the extent of surface covered by it.

Second. Three ounces of each of the fruits and vegetables were weighed out, placed in crucibles, and incinerated until nearly the whole of the carbon was dissipated, the colour of the ash being carefully noted. In those cases in which the fruit or vegetable was not contaminated with copper, the residual ash was observed to be either white or greyish white, while in those instances in which copper was present it was constantly of a pink colour; the depth varied uniformly with the amount of copper present.

When fruit or vegetable substances are carefully incinerated without being in any way disturbed, the general form of the fruit, &c., is in most cases tolerably well preserved; and it is then perceived that the pink colour is confined principally to the surface of the substance incinerated.

In those cases in which the amount of copper is but very small, the pink will be seen on the surface, only here and there, and will be of a pale tint. Where the quantity is larger, although still but small, the colour will be more general and more decided. Where it is abundant, the whole surface of the ash will be of a bright and beautiful rosy pink hue. Lastly, when the quantity of copper present is very considerable, the residual ash will be of a deep pink colour.

Olives, when incinerated, do not leave a clean white ash, so that although the pink colour may be very well detected in them, it is not of so bright a colour as in other fruit; but the colour is not confined, as in most other cases, to the surface of the fruit, but extends through the whole substance.

When a portion of the juice was incinerated along with the fruit, as was usually the case, the crucibles, if copper was present, became tinted with the same rosy pink colour as was observed on the surface of the fruit or vegetable incinerated. In some cases where the amount of copper was considerable, the bottoms of the crucibles became deeply and beautifully stained of a bright and iridescent pink.

The pink colour of the ash is thus explained: In the course of incineration, the vegetable acid with which the copper was combined, is destroyed, the highly characteristic pink oxide remains in the fruit perhaps in combination with lime, and its presence becomes revealed by its peculiar colour.

We have, then, in the colour of the ash a certain and beautiful test for the presence of copper, even in the most minute quantities, and likewise for the

Gorgona anchovies. The sprat may be readily distinguished from the y, by the dorsal fin which consists of seventeen rays, but more particu- the position of the ventral fin, which is placed in a vertical line directly he first dorsal fin-ray. The sardine is a shorter and thicker fish than the y; it has white flesh, and the relative position of the ventral and dorsal lifferent.

practice of imparting an unnatural red or brown colour to the fish and by means of Venetian red and bole Armenian, is in the highest degree ensible. To saturate an article of food with large quantities of earthy ng matter, is objectionable on the score of cleanliness; it is equally so as s health, for this earth contains a large quantity of iron. Now, this ne is not suited to all cases, and it may even, in some instances, be pro- of mischief; at all events, when it is desirable to take iron, we should that it be prescribed under the advice of a physician, and not administered rticle of food by our grocer, fishmonger, or Italian warehouseman.

in, it is not an uncommon thing for Venetian red to contain considerable ies of red lead; and although, in the analyses we have made, we are happy that *we have not detected that poisonous metallic oxide in a single sample*, s no question but that red lead is occasionally to be found in bottled ies.

in what, it may be asked, does this disgusting practice of mixing dirty substances with anchovies take its origin? Surely it is not practised for re sake of colour? In previous reports we have shown to what lengths cturers, for the sole sake of appearance, will go in the articles pickles, fruits, Cayenne pepper, &c.

e present case we believe the use of these substances does not arise solely he desire to produce a brilliant and striking-looking article, but that it is d to disguise and cover the dirty and muddy colour commonly presented brine in which the fish is imported; this dirty colour cannot be attributed y to the fish, but is due in part to the want of cleanliness in the salting, as to the impure character of the salt used.

unately, most consumers of this fish rinse it in water before eating, and et rid of much of the earth; but still a considerable quantity remains d to the fish, insinuating itself into the abdomen, between the scales, and ery portion of broken surface.

ovies, even when thus coarsely reddened, and put up in glass bottles, particularly sightly objects. Both for convenience and appearance, it be much better that they should be enclosed in open-mouthed earthen hich might be made of different patterns, and as ornamental as desired; means the necessity for colouring would be done away with as well as or resin, themselves frequently coloured with red lead, with which the f the bottles are smeared, and some of which, on the bottles being opened, finds its way into the contents. Now that glass is so cheap, if bottles e to be used, it would at all events be better that they should be furnished ass stoppers in place of corks.

E ANALYTICAL SANITARY COMMISSION AND ANCHOVIES.

To the Editor of THE LANCET.

R,

My attention has been drawn to a Report published in THE LANCET a ys since, where I am accused of selling anchovies in bottles that are half p with bay salt and rubbish. Now, in the first place, allow me to call ttention to the facts respecting these bottled fish. They are not packed elf or any person employed by me. At the time I bought them they warranted genuine Gorgona anchovy fish, and nothing else. I was also at they should be well packed in every respect; and had I known they ot agreeable to order, I should have returned them immediately to the l owner, whose name and address I enclose to you as follows:—Mr. Fre- Phillips, Fish Sauce Warehouse, opposite the Dun Cow, Old Kent Road, now in possession of all I have bought of him, I having returned them;

8th Sample.—Purchased of E. & J. Freeman, 3. Wigmore-street.

Contains *a small quantity of* COPPER. Ash *somewhat pink.* Solution of the ash, tested with ammonia, of a *faint blue.*

9th Sample.—Purchased of Crosse & Blackwell, 21. Soho-square.

Contains *a good deal of* COPPER. Ash of a *light* but *decided pink.* Solution of the ash, tested with ammonia, becoming of a *pale blue* colour; *a coating of copper* also being deposited on a rod of iron immersed in the acidulated solution.

10th Sample.—Purchased of Castell & Brown, 45. Princes-street, Leicester-square.

Does not contain copper. Ash of a *white* colour. The appearance of the gooseberries, in this case, differs remarkably from those of all the previous samples. The fruit is of a yellow colour, with scarcely a tinge of green. We have seen, in shop-windows at the West-end, gooseberries precisely resembling these in colour, and we believe, if inquiries were made, that in most cases it would turn out that the parties were supplied by Messrs. Castell & Brown.

GREENGAGES.

11th Sample.—Purchased of G. Whybrow & Co., 4. Minories.

Contains *a very considerable quantity of* COPPER. An iron rod immersed in the fluid in which the fruit is preserved became covered with *a thick coating of copper.* Ash of a *decided and rather deep pink* colour. Solution of the ash, tested with ammonia, changed to a *decided blue.*

12th Sample.—Purchased of Crosse & Blackwell, 21. Soho-square.

Contains *a very considerable quantity of* COPPER. An iron rod immersed in the fluid in which the fruit is preserved became *thickly coated all over with copper.* Ash of a *decided and rather deep pink* colour; solution of the ash, tested with ammonia changed to a *bright blue.*

13th Sample.—Purchased of E. Lazenby, 6. Edwards-street, Portman-square.

Contains *a very considerable quantity of* COPPER. An iron rod immersed in the fluid in which the fruit is preserved became *thickly coated with copper.* Ash of a *decided and rather deep pink colour*; solution of the ash tested with ammonia changed to a *bright blue.*

14th Sample.—Purchased of R. & C. Faulkner, 44. Jermyn-street.

Contains a *very considerable quantity of* COPPER. An iron rod immersed in the fluid in which the fruit is preserved became *thickly coated with that metal.* Ash of a *decided pink colour;* solution of the ash tested with ammonia changing to a *bright blue.*

It should be remarked, that in all the above cases, the greengages, as contained in the bottles, presented to the eye a suspicious and unnatural deep bluish-green colour, which was much heightened by boiling; in this state the fruit exhibited, in fact, the characteristic verdigris hue.

15th Sample.—Purchased of Hedges & Butler, 155. Regent-street.

Contains *a trace of copper only.* Ash *nearly white,* with a *shade of pink* here and there; solution of ash treated with ammonia became of *a very faint blue colour.*

16th Sample.—Purchased of Fortnum & Mason, 182. Piccadilly.

Contains *a small quantity of copper.* Ash *decidedly pink;* solution of ash treated with ammonia became *light blue.*

17th Sample.—Purchased of Castell & Brown, 45. Princes-street, Leicester-square.

Contains *a trace of copper.* Ash *slightly pink here and there.* Solution of ash treated with ammonia became *very faintly blue.* The greengages in this case were of large size, firm, and plump, the colour being well preserved and natural.

18th Sample.—Purchased of Howis & Masson, 216. Piccadilly.

Contains *a very small quantity of* COPPER. Ash *here and there slightly pink.* The greengages in this case were of large size, firm, and plump, the colour being well preserved without presenting an unnatural appearance.

Anchovy sauce and paste are adulterated in other ways; some of them can- be detected, others can.

It is very common for sprats, and other cheap fish, to be bruised up into a , mixed with flour and the necessary seasoning for anchovy sauce, and then flavour of the latter fish is imparted by means of a small quantity of the r obtained in salting it, or even an admixture of a small per-centage of the

Flour is an ingredient in the manufacture both of the paste and sauce; yet ry large quantity of it is often fraudulently introduced, to the exclusion of rtain per-centage of fish; and not only is flour employed for this purpose, large quantities of Venetian red, chalk, plaster of Paris; and it is generally the two latter ingredients are added, that red lead is also added to make up the decrease of colour the white admixture occasions." *

ULTS OF THE MICROSCOPICAL AND CHEMICAL EXAMINATION OF TWENTY-EIGHT SAMPLES OF POTTED MEATS AND FISH.

POTTED MEATS.

TONGUE.

Sample. — Purchased of Hedges & Butler, 155. Regent-street. In pot, marked with the initials R. W. Price 1*s.* 6*d.*

Colour pale pink, and perfectly natural; does not contain red earthy colouring matter.

BEEF.

Sample. — Purchased of E. Lazenby, 6. Edwards-street, Portman-square. In pot, marked with the initials R. W. Price 1*s.* 6*d.*

Colour pink, and perfectly natural; does not contain red earthy colouring matter.

Sample. — Purchased of J. Snelling, 30. Fenchurch-street. In pot. Price 1*s.*

Colour deep brownish red, arising from the presence of *bole Armenian.*

Sample. — Purchased of J. Burgess & Son, 107. Strand. In pot. Price 1*s.* 6*d.*

Colour deeper than natural; contains a small quantity of *bole Armenian.*

HAMBURGH BEEF.

Sample. — Purchased of E. & J. Freeman, 3. Wigmore-street, Cavendish-square. Price 1*s.* 6*d*

nnaturally red, from the presence of *bole Armenian.*

Sample. — Purchased of Messrs. Crosse & Blackwell, 21. Soho-square. Price 1*s.*

Colour reddish-brown, from the presence of much *bole Armenian.*

HAM.

Sample. — Purchased of E. Lazenby, 6. Edwards-street, Portman-square. In pot, marked with the initials R. W. Price 1*s.* 6*d.*

Of a pale and natural pink colour; does not contain *bole Armenian*, or any other red ferruginous earth.

Sample. — Purchased of Hedges & Butler, 155. Regent-street.

Of a pale and natural pink colour; does not contain *bole Armenian*, or any other red ferruginous earth.

WESTPHALIAN HAM.

Sample. — Purchased of Fortnum & Mason, 182. Piccadilly.

Of a pale and natural pink colour; does not contain *bole Armenian.*

POTTED FISH.

BLOATERS.

th Sample. — Purchased of Fortnum & Mason, 182. Piccadilly. In pot.

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* Treatise on the Falsification of Food, p. 251.

[illegible] BLOATERS; manufactory,
[illegible]
[illegible] arising from the presence of [illegible] contains much *starch*.
[illegible] — [illegible] Fleet-street. In pot. Price
[illegible]
[illegible]
[illegible] — [illegible] Fenchurch-street.
[illegible] very much *bole Armenian*.
[illegible] — [illegible] Messrs. Crosse & Blackwell, 21. Soho-square.
[illegible]
[illegible] earth, producing *bole Arm*
[illegible]
[illegible] — [illegible] Freeman, 3. Wigmore-street, Cavendish-
[illegible]
[illegible] red colour; contains a large quantity of
[illegible]
[illegible] — [illegible] Hedges & Butler, 155. Regent-street. Price
[illegible] a small quantity of *bole Armenian*.

SHRIMPS.

[illegible] — [illegible] Prosser, 202. Fleet-street. In pot. Price
[illegible] SHRIMPS.
[illegible] small quantity of *bole Armenian*.
[illegible] — [illegible] Batty & Co., 102. Leadenhall-street. In
[illegible]
[illegible] paste, and highly coloured with an imme
[illegible]

ANCHOVY PASTE.

[illegible] — Purchased of Hedges & Butler, 155. Regent-street. In p
[illegible] R. W. Price 1s. 6d.
[illegible] contains much *bole Armenian*.
[illegible] — Purchased of Thomas Snelling, 30. Fenchurch-street. Price
Of a [illegible] red colour; contains an immense quantity of *bole A*
[illegible]
[illegible] — Purchased of Wix & Son, 22. Leadenhall-street. Price 1s. 6d.
Of a vivid red colour; contains an immense quantity of a red earth, probabl
[illegible] and also some *starch*.
21st Sample. — Purchased of J. Prosser, 202. Fleet-street. In pot, labelled, Jo
[illegible] & SON'S ANCHOVY PASTE. Price 1s. 6d.
Of a deep and most unnatural red colour; contains a very large quantity
[illegible] *Armenian*, and also much *wheat-flour*.
22nd Sample. — Purchased of Fortnum & Mason, 182. Piccadilly. Price 1s.
Of a deep red colour; contains very much *bole Armenian*.
23rd Sample. — Purchased of J. Burgess & Son, 107. Strand. Price 1s. 6d.
Of a deep red colour; contains much *bole Armenian*.
24th Sample. — Purchased of J. Wingrave & Co., 80. St. Paul's-churchya
In barrel. Price 1s. 6d.
Colour deeper than natural; contains *bole Armenian*.
25th Sample. — Purchased of Batty & Feist, 102. Leadenhall-street. In barr
Price 1s. 6d.
Of a bright red colour; contains an immense quantity of *bole Armenian*.
26th Sample. — Purchased of Crosse & Blackwell, 21. Soho-square. In barr
Price 1s.
Unnaturally red; contains much *bole Armenian*.
27th Sample. — Purchased of E. Lazenby & Son, 6. Edwards-street, Portm
square. In bottle. Price 1s. 6d.
Very red, from admixture with an immense quantity of *bole Armenian*.
Sample. — Purchased of J. & E. Freeman, 3. Wigmore-street. In bar
ice 1s. 6d.
red; contains a considerable quantity of *bole Armenian*

om an examination of the above table of analyses, the following conclusions
be deduced :—

t. That the samples of *Potted Tongue* and *Ham* were entirely free from
adulteration.
d. That four out of the five samples of *Potted Beef* were artificially coloured
by means of the red earth, *bole Armenian.*
d. That the whole of the samples of *Potted Bloaters* examined were highly
coloured with the before-named earthy substance.
h. That one of the samples of *Bloater Paste* was adulterated in addition with
a large proportion of *starch* or *flour*, probably wheat-flour boiled.
h. That the entire of the samples of *Anchovy Paste* analysed were still more
highly, and even vividly, coloured with very large quantities of *bole Ar-
menian.*
h. That two of the *Anchovy Pastes* were in addition adulterated with *flour*;
one with a large per-centage of *wheat-flour.*
th. That of the twenty-eight samples of *Potted Meats* and *Fish* subjected to
analysis, no less than twenty-three were more or less impregnated with the
red earthy material, *bole Armenian.*

his picture of the adulteration of potted meats and fish is surely bad enough
disgraceful enough; it is yet satisfactory to know that it is not quite so bad
he remarks quoted at the beginning of this Report would lead us to infer.
he difference in the appearance presented by the uncoloured samples, con-
sted with those in which the bole Armenian had been added, was most striking,
usually sufficient to enable the observer to distinguish by the eye alone the
ples to which this scandalous addition had been made. While in the one
the paste was of a pale pink, and perfectly natural hue, in the other the
ur was such as the flesh, when pounded, of no fish or animal ever presents,
eing of a deep, earthy, and brick red.
n less obvious or doubtful cases the red earthy colouring matters may be
ected by shaking a portion of the paste well up with water; this will set the
h free, some of which, on account of its weight, will fall as a sediment, and
become visible either to the eye alone, or under the microscope.
still better and more ready method is, to place a minute portion of the
te on a slip of glass; and after having spread it out by means of a little
er, to view it as an opaque object under the microscope, with an object-glass
ne half-inch focus. In this way very minute quantities of the red earth
be detected.
n a previous article we showed that one of the principal reasons why artificial
uring matters are employed in the case of bottled anchovies, is to conceal
dirt contained in the brine in which the fish is imported. In the present
ance there is not even this poor excuse; the only purpose served by the em-
yment of the bole Armenian being to cause the articles to present a striking
earance, but one which at the same time is, in our opinion, most unnatural,
d but little inviting.
In the case too of potted meats and fish, the colouring ingredients cannot,
in anchovies, be got rid of, to some extent at least, by washing; for since
ey are incorporated with the paste, they must be entirely consumed with the
eat or fish.
That the practice of adding large quantities of coloured earthy substances to
ticles of diet is dirty, injurious to health, and, in some cases, even dangerous
life, cannot be doubted. The chief medicinal ingredient in bole Armenian is
ide of iron; this, although not dangerous, might in some instances be pro-
ctive of prejudicial effects; but it sometimes happens that other red earths
e used, and these as well as also occasionally, although rarely, bole Armenian
elf, are contaminated with red-lead; *for this poisonous substance each of the
ve twenty-eight samples have been separately analysed, without however, we
happy to state, a particle of it being discovered in a single instance. The
ole of the samples have likewise been examined for chalk and plaster of Paris.*
As long, then, as manufacturers continue to mix red earths with their potted
ats and fish,—these delicacies of the table, as they are commonly considered,
often had recourse to by the gourmand and the invalid to rouse a flagging

2nd Sample.—Purchased of Thomas Snelling, 30. Fenchurch-street. P
1*s*. 3*d*.

Appearance, taste, and composition very similar to Sample 1.; it cer
consists in great part of *treacle* and *salt*.

3rd Sample.—Purchased of Fenning & Hale, 5. Poultry, London. Price
Composition the same as the previous samples, it consisting chiefly of *tr*
and *salt*.

4th Sample.—Purchased of J. Wingrave & Co., 80. St. Paul's-church
Price 1*s*. 6*d*.

Composition apparently the same as in the previous samples, it cons
principally of *treacle* and *salt*.

5th Sample.—Purchased of John Burgess & Son, 107. Strand. Price 1
Composition apparently the same as in the previous samples, *treacle* and
being the chief ingredients. Neither *copper* nor *lead* was detected in
or the above samples.

By the above observations, we do not mean to imply that the samples of
examined may not consist, either in part or entirely, of genuine India Soy;
this we do say, that, if genuine, then is Soy little better than a mixtur
treacle and salt, out of which ingredients we undertake to produce an ar
scarcely if at all distinguishable from the samples referred to.

HARVEY'S FISH SAUCE.

6th Sample.—Purchased of E. Lazenby & Son, 6. Edwards-street, Port
square. Price 1*s*. 3*d*.

This sauce is of a blackish-brown colour, and is perfectly liquid, sc
any sediment being deposited. It contains *vinegar*, *catsup*, and muc
Examined with the microscope, there were detected in it a large qu
of the octohedral crystals of *oxalate of lime*, and very minute ch
fragments of charred *deal*. The oxalic acid is derived from some
table substance which contains a large quantity of combined oxalic
employed in the manufacture of the sauce; the presence of the c
wood can scarcely be accidental, and this is probably used to height
colour of the liquid. No *lead* or *copper* present.

COCKS'S READING SAUCE.

7th Sample.—Purchased of J. Freeman, 3. Wigmore-street, Cavendish-
Price 1*s*. 6*d*.

This sauce is of a blackish-brown colour, and perfectly clear and liqu
contains *vinegar*, much *cayenne* and *salt*, *catsup*, and perhaps
quantity of *shallots* or *garlic* and *soy*. No *lead* or *copper* detected.

HICKSON'S KING OF OUDE SAUCE.

8th Sample.—Purchased of J. Freeman, 3. Wigmore-street. Price 1*s*.
This sauce is thick, pulpy, and of a *green* colour. It contains *vinegar*,
a little *cayenne*, *turmeric*, some green herb, probably *sorrel*, which
the colour to the sauce, and also a large quantity of some vegetab
stance, the cells of which are about the size of those of the potat
which turn blue on coming into contact with a solution of iodine.
copper nor *lead* was present.

LAZENBY'S KING OF OUDE SAUCE.

9th Sample.—Purchased of Lazenby & Son, 6. Edwards-street, P
square. Price 1*s*. 6*d*.

This sauce is thick, pulpy, and of a *yellow* colour; it contains *vinegar*
mustard, *turmeric*, some *cayenne*, *wheat-flour*, finely-chopped *ra*
abundance, probably *shallots*, and other vegetable substances.
totally different sauce from the preceding. Neither *lead* nor *cop*
present.

WIX'S KING OF OUDE SAUCE.

10th Sample.—Purchased of Wix & Sons, 22. Leadenhall-street. Pric est and most celebrated sauces. The minute structure of the tomato, as with the microscope, is sufficiently characteristic to allow of its ready iden- tion. The cells of which the epidermis is formed are rather small, flat, lar, and well-defined, while those of the pulp are several times larger, more ss round, and enclose the colouring matter, and a few globules also coloured, abling oil; the cells of the ripe fruit do not contain starch, and hence do ecome blue on the addition of a solution of iodine.

rlic and *shallots* both belong to the same genus of plants as the onion, the being named *Allium sativum*, and the second *Allium ascalonicum;* their ur is stronger, but more delicate than that of the common onion. They uch used in French cookery, and enter into the composition of many sauces.

rragon, known in botany as the *Artemesia dracunculus*, is a mild aromatic ; it is well suited for use in soups.

e whole of the above vegetable substances employed in the manufacture of es may be detected, when not greatly altered by previous prolonged boiling, eans of the microscope; and many of them may even be recognised after ng been subjected to the action of boiling water. The microscope is capable, efore, of affording very valuable assistance in the determination of the in- lients which enter into the composition of many sauces; when, however, composition is very complex, much time and patience are required before he ingredients used can be identified.

he structure of very many of the productions above referred to has been ady fully described and represented by woodcuts in previous articles, as tard, pepper, cayenne, cumin and fœnugreck seeds, turmeric, mace, nutmeg, all the spices. By a little previous study of the fresh roots, leaves, and ls used in the preparation of sauces, and of which descriptions have not yet given, the inquirer would soon find himself able to identify the majority he ingredients entering into the formation of any particular sauce.

the article on Potted Meats and Fish, we have already published the arks of Mr. Mitchell in reference to the adulteration of anchovy paste and e; we will now quote the observations made by Accum, under the head of isonous Anchovy Sauce."

Several samples which we have examined of this fish sauce have been found aminated with lead.

The mode of preparation of this fish sauce consists in rubbing down the en anchovy in a mortar; and this triturated mass, being of a dark-brown ur, receives, without much risk of detection, a certain quantity of Venetian added for the purpose of colouring it, which, if genuine, is an innocent (?) uring substance; but instances have occurred of the pigment having been terated with orange-lead, which is nothing else than a better kind of minium ed oxide of lead.

The conscientious oilmen, less anxious with respect to colour, substitute for poison the more harmless pigment, called Armenian bole."

the following analyses, the object in view has been, not so much to deter- e the nature of the ingredients entering into the composition of the several ces, as the detection of adulteration. All that has been aimed at, with respect he composition, has been, to afford some idea of the nature of certain of the ces.

ELTS OF THE MICROSCOPICAL AND CHEMICAL EXAMINATION OF THIRTY-HREE SAMPLES OF THE PRINCIPAL SAUCES, OBTAINED CHIEFLY FROM ANUFACTURERS.

INDIA SOY.

Sample. — Purchased of Batty & Co., Pavement, Finsbury-square. Price *1s. 6d.*

his article is dark, thick, and like syrup; it is made up to a great extent of treacle slightly burned; and judging from the consistence, appearance, and taste, it appears to be little else than *treacle* very strongly flavoured with *salt.* Examined with the microscope, there were detected in it numerous oval sporules of the fungus invariably present in treacle.

Of an intense and unnatural red colour; this sauce consists of *tomato*, *vin* *mace*, and probably some other seasoning ingredients, the whole b highly coloured with *bole Armenian*.

18*th Sample*.—Purchased of Messrs. Crosse & Blackwell, 21. Soho-sq Price 1*s*. 3*d*.

This sauce is of a very unnatural red colour, and consists principally of to and *vinegar*, highly coloured with *bole Armenian*.

19*th Sample*.—Purchased of Burgess & Son, 107. Strand. Price 1*s*. 6*d*.

Of a very unnatural red colour; consists of *tomato*, *vinegar*, and a bla two of *mace*, the whole being reddened by the addition of a consider quantity of *bole Armenian*.

20*th Sample*.—Purchased of Fenning & Hale, Poultry. Price 1*s*.

Of a most unnatural red colour, and consists chiefly of *tomato* and *vin* deeply coloured with a very large quantity of *bole Armenian*.

21*st Sample*.—Purchased of Wingrave & Co., St. Paul's-churchyard bottle. Price 1*s*. 6*d*. labelled thus:—

Sauce de Tomates.
D'un flaveur superieur,
Exportées à
J. Wingrave et Cie.,
à Londres, par Maille,
Vinaigrier-distillateur
du Roi et de LL. MM. les Empereurs d'Autriche et de Russie.

Of an intense and unnatural red colour; consists of *tomato*, *vinegar*, a li *mace*, and very much of the red earth, *bole Armenian*. Neither *lead* *copper* was detected in any of the samples of tomato sauce.

Essence of Lobsters.

22*nd Sample*.—Purchased of C. Wix & Sons, Leadenhall-street. Price 1*s*. 6

On being allowed to stand at rest for some time, a deposit of an intense colour falls, which occupies about half the bottle, the remainder being fi with a black liquid; this liquid consists chiefly of *catsup*: while the s ment is made up of a little *muscular fibre*, *starch*, and an immense qua of *Venetian red*.

23*rd Sample*.—Purchased of Batty & Co., Pavement, Finsbury. Price 1*s*. 6

Of a most unnatural red colour; contains *muscular fibre*, a little *mushr* *catsup*, and an immense quantity of red earth, it being almost satura with *bole Armenian*.

Essence of Shrimps.

24*th Sample*.—Purchased of Fenning & Hale, Poultry. Price 1*s*. 3*d*.

Contains a little *catsup*, scarcely any *muscular fibre*, but is nearly satura with *bole Armenian*.

25*th Sample*.—Purchased of C. Wix & Sons, 22. Leadenhall-street. Price 1*s*.

Contains *mushroom catsup*, *starch*, some *muscular fibre*, and an imme quantity of *bole Armenian*. Neither *lead* nor *copper* was detected in any the samples of essence of shrimp and lobsters.

Essence of Anchovies.

26*th Sample*.—Purchased of William Lazenby, 6. Edwards-street, Portm square. Price 1*s*. 3*d*.

Intensely coloured with a very large quantity of *bole Armenian*.

27*th Sample*.—Purchased of Burgess & Son, 107. Strand. Price 1*s*. 6*d*.

Of a most unnatural red colour, from admixture with an enormous quan of *bole Armenian*.

28*th Sample*.—Purchased of Mr. Phillips, Strutton-ground, Westmins Price 1*s*.

Smells oily and offensive; on standing at rest for some time, a deposit which occupies two-thirds of the bottle, the other third being filled wi watery liquid; the sediment consists of *muscular fibre*, and an imme quantity of dirty-looking bole Armenian.

Sample.—Purchased of Fenning & Hale, 5. Poultry. Price 1*s.*
a most unnatural but dull red colour, arising from admixture with an immense quantity of *bole Armenian;* it contains, moreover, many of the scales of the fish.

Sample.—Purchased of J. Wingrave & Co., St. Paul's-churchyard. Price 1*s.* 3*d.*
a vivid and most unnatural red colour, which arises from admixture with a very large quantity of *bole Armenian.*

Sample.—Purchased of Thomas Snelling, 30. Fenchurch-street. Price 1*s.*
an intense and most unnatural red colour, it being almost saturated with *bole Armenian.*

Sample.—Purchased of G. Wybrow, 4. Minories. Price 1*s.*
a very unnatural red colour. Contains scarcely any muscular fibre, but an immense quantity of *bole Armenian.* Neither *lead* nor *copper* was detected in this or any of the other samples of essence of anchovy.

Freeman's Fish Sauce.

Sample.—Purchased of J. Freeman & Co., 3. Wigmore-street. Price 2*s.*
This sauce is of a pale-brown colour, liquid, and transparent, without a particle of sediment; it contains a very small quantity of *mushroom catsup*, much *salt*, and the juice or essence of the *anchovy;* it is free from all adulteration, and is certainly a much more pleasant and wholesome sauce than the highly-coloured and adulterated compound ordinarily sold under the misnomer "Essence of Anchovies."

The following are the chief results deducible from a consideration of the above ble of Analyses:—

1st. That *treacle* and much *salt* formed the bases of the five samples of India Soy examined, if they did not even entirely consist of these two ingredients.

2nd. That in Lazenby's Harvey's Fish Sauce much *oxalate of lime*, and numerous minute chips of *charred deal*, were detected, the presence of these last affording some countenance to the inference that they had been used for the purpose of imparting colour to the sauce.

3rd. That of the seven samples of Tomato Sauce analysed, six were artificially coloured, one probably with *cochineal*, and the rest by the addition of considerable quantities of the ferruginous pigment, *bole Armenian.*

4th. That the samples of Essence of Lobsters examined were almost saturated with very large quantities of *bole Armenian.*

5th. That the samples of Essence of Shrimps were saturated to an equal extent with *bole Armenian.*

6th. That the whole of the samples of Essence of Anchovies analysed were adulterated with immense quantities of the ferruginous oxide *bole Armenian.*

7th. That three of the samples of *Essence of Anchovy* contained but a small quantity of *muscular fibre.*

8th. That two of the samples contained a proportion of *flour*—one being a sample of essence of shrimps, and the other of essence of lobster.

9th. That out of the eighteen red sauces submitted to examination, no less than sixteen contained *bole Armenian*, and this usually in immense quantities, far exceeding what was detected in any of the potted meats and fish.

10th. That lead, for which separate analyses were made in each case, *was not detected in a single instance.*

11th. That *traces only of* copper *were discovered in some three or four samples.*

The above results, then, regarded as a whole, although bad enough, are yet not so bad or serious as the account given by Accum and some other writers, of the adulteration of anchovy paste, &c., would lead us to infer, since neither lead nor copper was detected in a single instance. Some idea of the quantity of pigment contained in many of the red sauces may be formed, when it is stated that, mixed with turpentine, they might be employed as paints in the priming of doors, windows, &c.

There is no reason why sauces should be regarded as secret and patent arti-

intense a green as to impart to the fruit as seen through the bottle a de
green colour.

As a rule, the amount of copper ordinarily present in many kinds o
bottled fruits and vegetables, is greater for even equal quantities than i
pickles, which, as we some months since showed, also frequently contain th
metal in large and almost poisonous quantity. Add to this the fact that wh
pickles are used in small quantity only, a whole bottle of preserved fruit i
consumed by two or three persons at one time; hence we perceive how muc
more dangerous is the employment of copper in the case of fruits than in th
of pickles.

The present adds another instance to the many which have already bee
adduced, in which manufacturers, in order to heighten the colour of article
and as they conceive, often very erroneously, to preserve their appearance, hav
sacrificed their flavour and quality, and have risked health, and even safety.

"*To the Editor of* The Lancet.

Sir, — Having taken considerable interest in the reports of the Analytical
Sanitary Commission, I too have had my eyes opened to the necessity of watch-
fulness in the purchase of articles of food. Of this I will give you a late
instance.

I had bought a bottle of preserved gooseberries from one of the most respect-
able grocers in this town, and had had its contents transferred into a pie. It struck
me that the gooseberries looked fearfully green when cooked; and on eating one
with a steel fork, its intense bitterness sent me in search of the sugar. After
having sweetened and mashed the gooseberries with the same steel fork, I was
about to convey some to my mouth, when I observed the prongs to be completely
coated with a thin film of bright metallic copper. My testimony can be borne
out by the evidence of three others, two of whom dined at my table.

It is a fortunate circumstance that, considering the frequent presence of
copper in pickles and preserves, its detection is so easy. I hope you will excuse
my troubling you.

I remain, Sir, yours respectfully,
Albert J. Bernays, F.C.S., &c.

Chemical Laboratory, Derby, Jan. 1853.

Our correspondent's communication is in many respects valuable, especiall
as showing the dangerous adulterations practised by the manufacturers of bottl
fruits, and also the correctness of the Analytical Sanitary Commission; but it
deficient in the most important point — viz., Mr. Bernays has omitted to give t
name of the party from whom the preserved gooseberries were procured. W
should all the respectable grocers in Derby be exposed to suspicion, because o
of them has sold preserved gooseberries strongly impregnated with a poisono
solution? The name of the vendor should be published; and his integrity w
not be impugned in the slightest degree, if he, in his turn, publishes the na
and address of the manufacturer by whom he was supplied with the poison
commodity. The publication of the names and addresses of the offending part
has been throughout the boldest feature of our Commission, and has excited
it universal attention and respect. — Ed. L."

MESSRS. CROSSE AND BLACKWELL.

The following remarks appeared in The Lancet recently, amongst Answ
to Correspondents: —

"The samples were entirely free from copper. The practice referred to
imparting to bottled and preserved fruits and vegetables a bright green col
by means of a poisonous salt of copper, still prevails extensively. Nothing
be more pernicious than this practice; it has, he [illegible] ceived a consider
check by the publication of the Reports of the [illegible] nitary Commis
on this subject. One firm we know, that of [illegible] e and Blackw
whose establi [illegible] is the most extensive of [illegible] n this branc

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Sample.—Purchased of Thomas Snelling, 30. Fenchurch-street. Price 1*s.*
an intense and most unnatural red colour, it being almost saturated with *ole Armenian.*

Sample.—Purchased of G. Wybrow, 4. Minories. Price 1*s.*
a very unnatural red colour. Contains scarcely any muscular fibre, but immense quantity of *bole Armenian.* Neither *lead* nor *copper* was deected in this or any of the other samples of essence of anchovy.

FREEMAN'S FISH SAUCE.

Sample.—Purchased of J. Freeman & Co., 3. Wigmore-street. Price 2*s.*
is sauce is of a pale-brown colour, liquid, and transparent, without a particle of sediment; it contains a very small quantity of *mushroom catsup,* much *salt,* and the juice or essence of the *anchovy;* it is free from all adulteration, and is certainly a much more pleasant and wholesome sauce than the highly-coloured and adulterated compound ordinarily sold under the misnomer "Essence of Anchovies."

he following are the chief results deducible from a consideration of the above le of Analyses:—

t. That *treacle* and much *salt* formed the bases of the five samples of INDIA SOY examined, if they did not even entirely consist of these two ingredients.

d. That in LAZENBY'S HARVEY'S FISH SAUCE much *oxalate of lime,* and numerous minute chips of *charred deal,* were detected, the presence of these last affording some countenance to the inference that they had been used for the purpose of imparting colour to the sauce.

d. That of the seven samples of TOMATO SAUCE analysed, six were artificially coloured, one probably with *cochineal,* and the rest by the addition of considerable quantities of the ferruginous pigment, *bole Armenian.*

h. That the samples of ESSENCE OF LOBSTERS examined were almost saturated with very large quantities of *bole Armenian.*

h. That the samples of ESSENCE OF SHRIMPS were saturated to an equal extent with *bole Armenian.*

h. That the whole of the samples of ESSENCE OF ANCHOVIES analysed were adulterated with immense quantities of the ferruginous oxide *bole Armenian.*

h. That three of the samples of *Essence of Anchovy* contained but a small quantity of *muscular fibre.*

h. That two of the samples contained a proportion of *flour*—one being a sample of essence of shrimps, and the other of essence of lobster.

th. That out of the eighteen RED sauces submitted to examination, no less than sixteen contained *bole Armenian,* and this usually in immense quantities, far exceeding what was detected in any of the potted meats and fish.

0th. That LEAD, for which separate analyses were made in each case, *was not detected in a single instance.*

1th. That *traces only of* COPPER *were discovered in some three or four samples.*

The above results, then, regarded as a whole, although bad enough, are yet so bad or serious as the account given by Accum and some other writers, of adulteration of anchovy paste, &c., would lead us to infer, since neither lead copper was detected in a single instance. Some idea of the quantity of ment contained in many of the red sauces may be formed, when it is stated t, mixed with turpentine, they might be employed as paints in the priming oors, windows, &c.

here is no reason why sauces should be regarded as secret and patent arti-

the green colour of fruits and vegetables, has already been remarked upon in the Report on Pickles. This action is exerted upon the green contents of the cells, the chlorophylle, and hence it is the coloured portions of vegetables and fruits, as those invested by the epidermis, which are most affected by this substance. The copper used accumulates in this membrane as a salt, as an acetate, a citrate, or a malate of copper.

The presence of copper, however, in fruits and vegetables is not confined to the coloured portions; it penetrates through the whole tissue, and a considerable part of the metal used even remains diffused throughout the fluid in which the vegetable substance is contained: hence it is desirable to analyse for copper not only the preserved article itself, but also the fluid in which it is immersed.

The processes for examination adopted in the subjoined analyses were as follows:—

First. About three ounces of the juice or fluid in which the fruit or vegetable was preserved were measured out, placed in a test-glass, and the acidity having been slightly increased by the addition of about three drops of strong nitric acid, a polished rod of iron was placed in the fluid, and allowed to remain for about twenty-four hours. If copper was present in considerable amount, the surface of the rod, from top to bottom, became covered with a continuous and bright coating of that metal. If the amount of copper was less considerable, the upper half or so only of the rod received the coating. If the quantity was very small indeed, no perceptible deposit of copper took place.

Hence we perceive that the iron rod affords a simple and most conclusive test for copper in fruits and vegetables, when present in anything like considerable amount; and that it even serves to indicate, to a certain extent, the quantity of copper with which the juice of different samples is impregnated, as shown by the rapidity with which the deposit occurs, by the thickness of the coating, and by the extent of surface covered by it.

Second. Three ounces of each of the fruits and vegetables were weighed out, placed in crucibles, and incinerated until nearly the whole of the carbon was dissipated, the colour of the ash being carefully noted. In those cases in which the fruit or vegetable was not contaminated with copper, the residual ash was observed to be either white or greyish white, while in those instances in which copper was present it was constantly of a pink colour; the depth varied uniformly with the amount of copper present.

When fruit or vegetable substances are carefully incinerated without being in any way disturbed, the general form of the fruit, &c., is in most cases tolerably well preserved; and it is then perceived that the pink colour is confined principally to the surface of the substance incinerated.

In those cases in which the amount of copper is but very small, the pink will be seen on the surface, only here and there, and will be of a pale tint. Where the quantity is larger, although still but small, the colour will be more general and more decided. Where it is abundant, the whole surface of the ash will be of a bright and beautiful rosy pink hue. Lastly, when the quantity of copper present is very considerable, the residual ash will be of a deep pink colour.

Olives, when incinerated, do not leave a clean white ash, so that although the pink colour may be very well detected in them, it is not of so bright a colour as in other fruit; but the colour is not confined, as in most other cases, to the surface of the fruit, but extends through the whole substance.

When a portion of the juice was incinerated along with the fruit, as was usually the case, the crucibles, if copper was present, became tinted with the same rosy pink colour as was observed on the surface of the fruit or vegetable incinerated. In some cases where the amount of copper was considerable, the bottoms of the crucibles became deeply and beautifully stained of a bright and iridescent pink.

The pink colour of the ash is thus explained: In the course of incineration, the vegetable acid with which the copper was combined, is destroyed, the highly characteristic pink oxide remains in the fruit perhaps in combination with lime, and its presence becomes revealed by its peculiar colour.

We have, then, in the colour of the ash a certain and beautiful test for the *presence* of copper, even in the most minute quantities, and likewise for the determination of its amount to a certain extent, not only in bottled fruits, but in most vegetable substances, and especially in pickles.

Third. The tint having been carefully noted, a scruple of strong nitric acid was added to the ash, and after the lapse of two or three hours, six drachms of distilled water were poured upon it; and the solution, after standing another hour or so, was filtered; to the filtered and clear solution a few drops of concentrated solution of ammonia were added, when, if copper was present, the mixture became of a blue colour, the tint varying through all shades and degrees, from a pale and scarcely perceptible bluish hue to a rich and deep azure, according to the quantity of the metal present.

Fourth. The ammoniacal solution was diluted with an ounce or so of distilled water, rendered slightly acid, and the polished iron rod immersed in it. In this way a coating of copper was often obtained from the acidulated solution of the ash, in cases where no deposit of metal took place on immersion of the iron in the juice in which the fruit or vegetable was preserved.

RESULTS OF THE CHEMICAL EXAMINATION OF THIRTY-FOUR SAMPLES OF —

BOTTLED FRUITS AND VEGETABLES.

PURCHASED AT THE ESTABLISHMENTS OF MANY OF THE PRINCIPAL PRESERVERS OF THESE ARTICLES; AS ALSO OBTAINED FROM GROCERS, FRUITERERS, AND OTHER RETAILERS RESIDENT IN THE METROPOLIS.

BOTTLED FRUITS.

RED CURRANTS.

1st Sample.—Purchased of T. Snelling, 30. Fenchurch-street.
Contains a *trace of copper* only. Ash nearly *white;* solution of the ash, tested with ammonia, exhibiting a *faint blue tinge* only, and no deposition of the metal taking place on the iron rod immersed in the acidulated solution.

RASPBERRIES AND CURRANTS.

2nd Sample.—Purchased of E. Fenning, 5. Poultry.
Not a trace of copper to be detected. Ash *white.*

3rd Sample.—Purchased of Crosse & Blackwell, 21. Soho-square.
Not a trace of copper to be detected. Ash *white.*

CHERRIES.

4th Sample.—Purchased of Crosse & Blackwell, 21. Soho-square.
Not a trace of copper to be detected. Ash *white.*

GOOSEBERRIES.

5th Sample.— Purchased of G. Waybrow & Co., 4. Minories.
Contains *a good deal of* COPPER. Ash of a *pink* colour. Solution of the ash, tested with ammonia, *decidedly blue.* An iron rod immersed in the acidulated solution of the ash became covered with *a thin coating of copper.*

6th Sample.— Purchased of T. Snelling, 30. Fenchurch-street.
Contains *a good deal of* COPPER. Ash of a *pink* colour. Solution of the ash, tested with ammonia, of *a pale blue:* an iron rod immersed in the acidulated solution received *a coating of copper.*

7th Sample.—Purchased of E. Fenning, 5. Poultry.
Contains *a very large quantity of* COPPER. A polished iron rod immersed in the fluid in which the fruit was preserved became *completely coated with copper.* Ash of a *deep pink colour.* Solution of the ash, tested with ammonia, of a *rich* and *deep blue.* An iron rod immersed in the acidulated solution became *thickly coated with copper in a few minutes.* The fruit, when boiled, changing to a *deep-bluish* and *most unnatural green colour.* Of all the samples of preserved fruits and vegetables analysed, this contained the most copper.

8th Sample.—Purchased of E. & J. Freeman, 3. Wigmore-street.

Contains *a small quantity of* COPPER. Ash *somewhat pink.* Solution of the ash, tested with ammonia, of a *faint blue.*

9th Sample.—Purchased of Crosse & Blackwell, 21. Soho-square.

Contains *a good deal of* COPPER. Ash of a *light* but *decided pink.* Solution of the ash, tested with ammonia, becoming of a *pale blue* colour; *a coating of copper* also being deposited on a rod of iron immersed in the acidulated solution.

10th Sample.—Purchased of Castell & Brown, 45. Princes-street, Leicester-square.

Does not contain copper. Ash of a *white* colour. The appearance of the gooseberries, in this case, differs remarkably from those of all the previous samples. The fruit is of a yellow colour, with scarcely a tinge of green. We have seen, in shop-windows at the West-end, gooseberries precisely resembling these in colour, and we believe, if inquiries were made, that in most cases it would turn out that the parties were supplied by Messrs. Castell & Brown.

GREENGAGES.

11th Sample.—Purchased of G. Whybrow & Co., 4. Minories.

Contains *a very considerable quantity of* COPPER. An iron rod immersed in the fluid in which the fruit is preserved became covered with *a thick coating of copper.* Ash of a *decided and rather deep pink* colour. Solution of the ash, tested with ammonia, changed to a *decided blue.*

12th Sample.—Purchased of Crosse & Blackwell, 21. Soho-square.

Contains *a very considerable quantity of* COPPER. An iron rod immersed in the fluid in which the fruit is preserved became *thickly coated all over with copper.* Ash of a *decided and rather deep pink* colour; solution of the ash, tested with ammonia changed to a *bright blue.*

13th Sample.—Purchased of E. Lazenby, 6. Edwards-street, Portman-square.

Contains *a very considerable quantity of* COPPER. An iron rod immersed in the fluid in which the fruit is preserved became *thickly coated with copper.* Ash of a *decided and rather deep pink colour*; solution of the ash tested with ammonia changed to a *bright blue.*

14th Sample.—Purchased of R. & C. Faulkner, 44. Jermyn-street.

Contains a *very considerable quantity of* COPPER. An iron rod immersed in the fluid in which the fruit is preserved became *thickly coated with that metal.* Ash of a *decided pink colour;* solution of the ash tested with ammonia changing to a *bright blue.*

It should be remarked, that in all the above cases, the greengages, as contained in the bottles, presented to the eye a suspicious and unnatural deep bluish-green colour, which was much heightened by boiling; in this state the fruit exhibited, in fact, the characteristic verdigris hue.

15th Sample.—Purchased of Hedges & Butler, 155. Regent-street.

Contains *a trace of copper only.* Ash *nearly white,* with a *shade of pink* here and there; solution of ash treated with ammonia became of *a very faint blue colour.*

16th Sample.—Purchased of Fortnum & Mason, 182. Piccadilly.

Contains *a small quantity of copper.* Ash *decidedly pink;* solution of ash treated with ammonia became *light blue.*

17th Sample.—Purchased of Castell & Brown, 45. Princes-street, Leicester-square.

Contains *a trace of copper.* Ash *slightly pink here and there.* Solution of ash treated with ammonia became *very faintly blue.* The greengages in this case were of large size, firm, and plump, the colour being well preserved and natural.

18th Sample.—Purchased of Howis & Masson, 216. Piccadilly.

Contains *a very small quantity of* COPPER. Ash *here and there slightly pink.* The greengages in this case were of large size, firm, and plump, the colour being well preserved without presenting an unnatural appearance.

FRENCH OLIVES.

9th Sample.—Purchased of J. Wilmott & Co., 66. Gracechurch-street.
Contains *a very large quantity of* COPPER. An iron rod immersed in the fluid in which the fruit is preserved became *thickly coated with copper*. Ash of a *deep but dirty pink* colour; solution of the ash tested with ammonia changed to *a rich blue*.

0th Sample.—Purchased of J. Burgess & Son, 107. Strand.
Contains a *considerable quantity of* COPPER. An iron rod immersed in the fluid in which the fruit is preserved became *coated with copper*. Ash of a *deep but obscure pink* colour; solution of the ash tested with ammonia turning *decidedly blue*.

1st Sample.—Purchased of C. Wix & Sons, 22. Leadenhall-street.
Contains *a considerable quantity of* COPPER. An iron rod immersed in the fluid in which the fruit is preserved became *coated with copper*. Ash of an *obscure pink* colour; solution of the ash treated with ammonia *decidedly blue*.

2nd Sample.—Purchased of Harrington & Lucas, 74. Princes-street, Leicester-square.
Contains *a small quantity of* COPPER; solution of the ash tested with ammonia became of *a pale blue colour*, a *slight deposit of copper* taking place on a polished iron rod immersed in the acidulated solution of the ash. The fruit of a yellowish-olive colour, very different from that of the other samples.

3rd Sample.—Purchased of Sams & Co., 173. Piccadilly.
Contains *a very considerable quantity of* COPPER. An iron rod immersed in the fluid in which the fruit is preserved became *quickly covered with a thick deposit of copper*. Ash of a *deep but obscure pink* colour; solution of the ash treated with ammonia turned of a *deep blue*.

4th Sample.—Purchased of G. Neighbour & Sons, 149. Regent-street.
Contains *a small quantity of copper*. Ash *slightly pink;* solution of the ash treated with ammonia, *faint blue*. As viewed through the bottle, the olives in this sample appeared of a deep green colour, conveying the impression that they were highly coloured with copper. On removing them, however, from the bottle, they were seen to be of a dull yellowish-brown, and it then became evident that the green colour was entirely due to the intensely-coloured bottle.

SPANISH OLIVES.

25th Sample.—Purchased of Hedges & Butler, 155. Regent-street.,
Not a trace of copper. Ash *white*. The olives in this case were of a fawn colour, without a tinge even of green. We believe that Spanish olives are generally sold in their natural state, and are almost invariably free from any contamination with copper. In the case of French olives the object appears to be to render them as green as possible; and this is effected by the free use of copper, as well as enclosing them in deep green bottles.

LIMES.

6th Sample.—Purchased of J. Boyd, 59. Piccadilly. In bottle, labelled thus:

AUGUSTUS S. LEVY,
ENGLISH AND FOREIGN FRUITERER,
59. PICCADILLY.

Contains *a very small quantity of* COPPER. Ash *a little pink here and there*. Solution of the ash treated with ammonia became of *a faint blue* colour.

7th Sample.—Purchased of Fortnum & Mason, 182. Piccadilly.
Contains *a good deal of* COPPER. Ash of *a decided pink* colour; solution of the ash treated with ammonia, *light blue;* an iron rod immersed in the acidulated solution of the ash became *slightly coated with* copper.

Fruit Preserved in Jelly.

32*nd Sample.*—Purchased of Hooper & Sons, confectioners, Holborn.
Ash of two greengages very pink; solution, treated with ammonia, b
blue, showing the presence of much *copper*.

The fruit in this sample was enclosed in a small glass jar, of a bell shape, consisted of greengages, limes, sliced pears, &c., immersed in jelly. Sim glasses may be seen forming very pretty ornaments in a great number of sh windows at the present time.

Candied Citron Peel.

33*rd Sample.*—Purchased of Pye & Co., 37. Little Pulteney-street.
Ash of a decided pink colour, and contains a small quantity of *copper*.
34*th Sample.*—Purchased of R. C. Hall, 70. Wardour-street.
Ash light pink, and contains a small quantity of *copper*.
35*th Sample.*—Purchased of William Hale, 53. Brewer-street.
Ash deep pink, and contains a considerable quantity of *copper*.

The following are the principal conclusions to be deduced from a considera of the above Table of Analyses:—

1st. That the *Raspberry Jam* analysed contained a very considerable qu tity of *copper*.

2nd. That the four samples of *Gooseberry Jam* examined all contain *copper*.

3rd. That copper, sometimes in large amount, was detected in twelve of th fourteen samples of *Orange Marmalade* analysed.

4th. That three of the *Marmalades* were adulterated with large quantities *a vegetable substance*, most probably either *turnip* or *apple*. There is a kind of turnip, the seeds of which are frequently advertised in the Gar deners' Chronicle for sale, of a yellow colour, and which is called the oran turnip. We know not to what use this can be put unless in the adulteratio of orange marmalade.

5th. That the nine samples of *Greengage Jam* were all more or less impreg nated with *copper*, it being present in considerable amount in five of th samples.

6th. That the *Greengages* contained in three different boxes of *Crystalli Fruits* all owed their deep green colour to the presence of *copper*.

6th. That the *Limes* and *Greengages* present in a little glass jar of fruit pr served in jelly also owed their brilliant colour to a salt of *copper*.

8th. That *copper* was present in the three samples of *Candied Citron P* subjected to analysis.

9th. That *copper* was detected in no less than *thirty-three* of the *thirty-fo* samples of different preserves analysed: three contained *traces* only; in *eleven* the metal was present *in small quantity;* and in nineteen either in *considerable*, or even *very large amount*.

Knowing well the powerful action of vegetable juices, and also of sugar, upo copper, we have long entertained the belief that that metal would be ver frequently detected, on analysis, in preserves, jams, and jellies, as ordinarily prepared: we must acknowledge, however, that the result of actual investigation has far exceeded our expectations, since it has proved that preserves made in copper vessels not only almost invariably contain copper, but that the metal is often present in very considerable quantities, sufficient to tint the ash of a deep pink, and to cause the solution of the ash when treated with ammonia to become of a decided and sometimes even of a deep blue colour.

But the still larger quantities of copper detected in certain of the samples of greengage jam seem to show that, as was ascertained to be the case with bottled fruits and vegetables, some greening salt of copper, probably the acetate, is really intentionally introduced for the purpose of creating an artificial viridity.

It will be remembered that in a Report which we published some time sinc on bottled fruits and vegetables, copper was detected only in one of the sample purchased of Messrs. Castell and Brown, of Princes-street, Soho, namely, i the greengages, in which a very small quantity was discovered. From th circumstance, we were led to make favourable mention of this firm. It will b

ple.—Purchased of W. Hale, 53. Brewer-street, Golden-square.
ry deep pink; contains a very considerable quantity of *copper.*
ple.—Purchased of R. C. Hall, 70. Wardour-street.
cidedly pink; solution bright blue; contains much *copper.*
ple.—Purchased of A. Fraser & Co., 72. Piccadilly.
cidedly pink; contains a small quantity of *copper* only.
ple.—Purchased of Lazenby & Son, Edward-street, Portman-square.
a decided pink; contains a small quantity of *copper.*
ple.—Purchased of Lazenby & Son, Edward-street, Portman-square.
ve soft; contains a considerable quantity of *a vegetable substance*, most
ably *turnip* or *apple; ash* faint pink here and there; contains a trace
of *copper.*
ple.—Purchased of Burgess & Son, Strand.
llow, with pink here and there; contains a little *copper.*
ple.—Purchased of J. Wilmot & Co., Fenchurch-street, sold as James
ler & Sons' Marmalade, Dundee.
llowish; contains scarcely a trace of *copper.*

GREENGAGE JAM.

ple.—Purchased of Mr. Faulkener, Jermyn-street.
brown, with scarcely a tinge of green; *ash* slightly pink only in
; contains merely a trace of *copper.*
ple.—Purchased of E. Lazenby & Son, Edward-street, Portman-
re.
brown, with very little tinge of green; *ash* a little pink only; con-
a very small quantity of *copper.*
ple.—Purchased of Decastro & Co., Piccadilly.
ve of a deep and unnatural green colour; *ash* very pink; solution
blue, indicating the presence of a considerable quantity of *copper.*
ple.—Purchased of A. Fraser & Co., Piccadilly.
ve of a deep and unnatural green colour; *ash* very deep pink; solution
bright and deep blue, showing the presence of much *copper.*
ple.—Purchased of Mr. Hughes, 12. King-street, St. James-street.
greenish-brown; *ash* decidedly pink, and contains a considerable
tity of *copper.*
ple.—Purchased of Fortnum, Mason, & Co., Piccadilly.
ve of a much deeper green than natural; *ash* pink; contains some
er.
ple.—Purchased of Castell & Brown, Princes-street, Soho.
ve of a rich and unnatural green colour; capsule, in which it was in-
ated, tinted in places of a deep pink; *ash* itself pink, and containing
n inconsiderable quantity of *copper.*
ple.—Purchased of Phythian, 430. West Strand.
of preserve brownish-green; there were detected with the microscope
sugar *acari;* capsule a little tinted; *ash* somewhat pink; solution
ed with ammonia becoming of a deep blue colour, indicating the pre-
e of a very considerable quantity of *copper.*
ple.—Purchased of Batty & Co., Pavement, Finsbury.
of preserve greener than natural; capsule, in which it was incine-
l, tinted a little here and there; *ash* very pink, and contains not an in-
iderable quantity of *copper.*

CRYSTALLISED FRUITS.

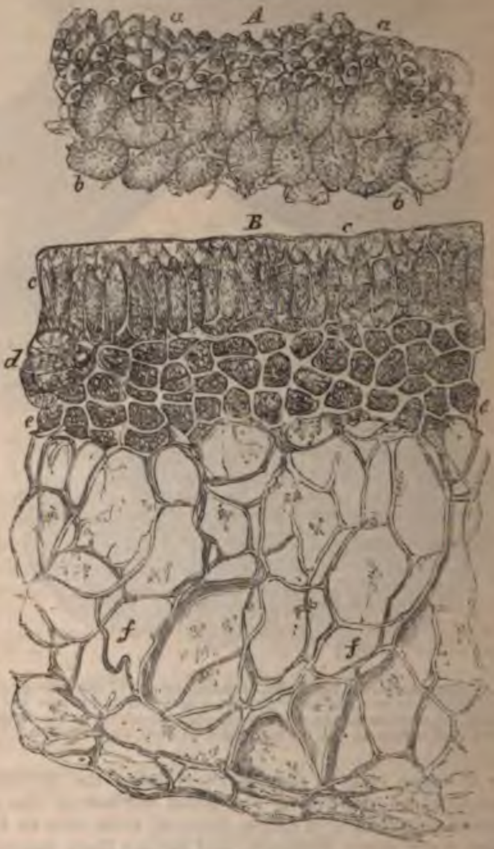
ple.—Purchased of Hedges & Butler, Regent-street.
three greengages of a decided pink colour; contains not an inconsi-
ble quantity of *copper.*
ple.—Purchased of Fortnum, Mason, & Co., Piccadilly.
three greengages of a decided pink colour; solution bright blue, indi-
g the presence of a considerable quantity of *copper.*
ple.—Purchased of Crosse & Blackwell, Soho-square.
three greengages of a deep pink colour, and containing a considerable
tity of *copper.*

present. It is only when the quantity of iron detected is greatly abov ordinarily contained in genuine curry-powder, that we can safely pron the sample to be adulterated with that metal.

Fig. 142.

Outer Coat or Testa of a Fœnugreck Seed.

(Magnified 220 diameters.)



A. Portion of the outer and second membrane stripped off; *a a*, peculiar bottle-like cells; *b b*, crenated cells of second membrane. *B.* Transverse section of husk of seed; *c c*, bottle-like cells; *d*, position of crenated cells; *e e*, layer of coloured cells merging into *f f*, the large cells which form the innermost membrane, filled with mucilage.

Results of the Microscopical and Chemical Analysis of Twen Samples of

CURRY-POWDER,

Purchased at the Establishments of various Grocers and Oilmen Metropolis.

1*st Sample.*—Purchased of W. M. Nicholson, 86. Upper-street, Islington *Contains* a small quantity of *salt*.

2*nd Sample.*—Purchased of Gluckner & King, 17. Mount-row, Islington *Contains* very much *ground rice*.

n that the greengage jam procured from Messrs. Castell and Brown, and lysed by us on this occasion, contained an amount of copper so considerable o render it difficult to believe that it could all be derived from the vessel hich it was prepared.

will be perceived, also, that three of the samples of orange marmalade examined e adulterated with large quantities of a vegetable substance, resembling in its roscopic structure either *turnip* or *apple*. These samples were all purchased ne beginning of December. Many other samples purchased in the summer, also several procured within the last few days, were all entirely free from such admixture. This appears to prove that this adulteration is practised fly at a certain period of the year, when oranges become scarce, and in order eep up the stock of marmalade, so called. The detection of this adulteration ree samples, two of them obtained at the establishments of different makers, ars also to show that the adulteration is a very general one.

he disclosures now made afford convincing proof how improper and even gerous it is to make preserves, as is commonly done even by ordinary house-ers, in copper saucepans. The vessels employed for this purpose should ist of earthenware, or, if metallic, should be lined with enamel.

lthough we may fairly expect to find copper in any preserved vegetable sub-ce prepared in the ordinary manner, yet we scarcely expected to meet with poison in those tasteful and sparkling little boxes of bonbons, which at this on of the year are spread out in shop windows so attractively; neither did xpect to find it making its way, through the citron-peel used, into our very istmas plum-pudding.

he evils and dangers arising out of the all-prevalent and very scandalous ctice of adulteration, nothing but the strong arm of the law can sufficiently ck, and the force of this, ere long, no doubt, will be felt. Nevertheless, we happy to find, that great and immediate good very frequently results from exposures which from time to time we are compelled to make; this is very dent in the case of pickles, and preserved fruits and vegetables. Although still see in shop windows hundreds of bottles of these articles exposed, hly charged with copper, yet it must be allowed that a very great improve-nt has taken place in this respect since the period of our first Report on kles. We have reason to believe that one very large manufacturing firm, ch supplies some hundreds of retail establishments, both in town and country, to a very great extent, if not entirely, abandoned the use of copper, and per utensils, in the greening of their pickles and preserves. Such an ex-le cannot but have an excellent effect on other manufacturers and preparers imilar articles.

ome of the samples, the analysis of which are given in this report, were chased of retail dealers, others of manufacturers. It is scarcely necessary to ark, that the former, as a rule, are in no respect responsible for the con-ination by copper discovered in so many of the samples subjected to analysis.

lthough we have not introduced analyses of samples of vegetable jellies, in so far as the method of preparation of these corresponds with that pted for preserves, they will of course be subject to similar contamination by per. We are informed on good authority that rasberry jelly frequently con- of nothing more than currant jelly to which the flavour of the rasberry has communicated by means of orris-root, and that the rasberry flavouring ugar confectionery consists of nothing but currant jelly and orris-root.

LARD, AND ITS ADULTERATIONS.

n is the oily portion of the fat of the pig. The process by which this is rated from the vesicular, fibrous, and vascular tissues in which it is either osed, or by which it is surrounded, is termed *lard-rending*.

he pieces of fat to be converted into lard are sometimes salted a little, the er to ensure their preservation, and are stored in barrels. The fat which ediately surrounds the kidneys yields the best and purest lard; this is owing

17th Sample.—Purchased of G. Mills, 33. South Molton-street.
Genuine, but contains a small quantity of *powdered cassia.*

18th Sample.—Purchased of W. J. Brown, 12. High-Street, Islington. In pack age, labelled

"GENUINE INDIA CURRY-POWDER."

Contains RED-LEAD, a considerable quantity of *potato-flour*, and much *salt.*

19th Sample.—Purchased of White & Fairchild, 63. Borough. In packag labelled

"SCHAH SOOJAH INDIA CURRY-POWDER."

Contains a considerable quantity of *ground rice*, and a little *salt.*

20th Sample.—Purchased of Fortnum & Mason, Piccadilly.
Genuine.

21st Sample.—Purchased of S. Dummer & Co., 14. Marylebone-street.
Contains very much RED-LEAD.

22nd Sample.—Purchased of Robinson, Piccadilly. In package labelled

"CAPTAIN WHITE'S CURRY-POWDER,
(Originally called SELIM'S.)"

Genuine.

23rd Sample.—Purchased of Bardsley & Co., 103. Tottenham-court-road.
Contains a large quantity of *ground rice.*

24th Sample.—Purchased of Andrews & Co., 107. Tottenham-court-road.
Contains a considerable quantity of RED-LEAD.

25th Sample.—Purchased of Salmon & Co., 69. Tottenham-court-road.
Contains RED-LEAD and a very large quantity of *ground rice.*

26th Sample.—Purchased of W. Gilbert, 92. Tottenham-court-road.
Contains a considerable quantity of *ground rice.*

From a review of the above Table of Analyses, the following conclusio may be deduced:—

Of the *twenty-six* samples of curry-powder submitted to microscopical a chemical examination,

1st. That *seven* only were *genuine.*
2nd. That *nineteen*, or nearly four-fifths were *adulterated.*
3rd. That *ground rice*, usually in very large quantities, was present in n samples.
4th. That *potato-farina* was detected in *one* sample.
5th. That *salt* was present in *eight* of the samples.
6th. That the highly poisonous metallic oxide, RED-LEAD, was detected no less than *eight* of the samples.
7th. That in *seven* of the samples, the adulteration consisted of *ground rice* o
8th. That in *one* sample, the adulteration consisted of *ground rice* and *sal*
9th. That in *one* sample, the adulteration consisted of *ground-rice* and R LEAD.
10th. That in *three* samples, the admixture consisted of *salt only.*
11th. That in *three* samples, the adulteration consisted of *salt* and RED-LEA
12th. That in *three* samples the adulteration consisted of RED-LED only.
13th. That in *one* sample, the adulteration consisted of RED-LEAD in con nation with *potato-farina* and *salt.*

The above results do not give the whole of the adulterations to which twenty-six samples have been subjected, since they do not include the FER GINOUS EARTHS, which were shown, in our article on Cayenne, to be so freque employed to impart colour to that substance. In consequence of the large variable quantity of iron present in genuine curry-powder, it is not easy a rately to determine in what cases that metal exists in excess. The ferrugi earths consist of alumina, in combination with a small and variable amou iron in the condition of red oxide.

We have thus shown that curry-powder is adulterated to nearly the s extent, and frequently with ingredients equally pernicious, as the subject of last report, namely, cayenne.

r also adds it for the purpose of communicating to the lard the property of
itating the raising and increasing the whiteness of the confectioners' paste,
hich it is largely employed."

should be understood, that American lard, as brought to this country, is
in general adulterated. The adulteration usually takes place subsequent to
rrival, and is the work of some of our own manufacturers. The reason why
rican lard is so frequently selected for adulteration is, that it is of very in-
r quality and value, and so soft as to be almost fluid, some process of con-
lation being indispensable before it can be employed as lard.

rom information received from a respectable lard-render, it appears that the
tion of a small quantity of mutton suet to lard is very common. It is used
e particularly in warm weather, and with soft lards, especially American
which differs from ordinary lard, in that it consists of the entire fat of the
melted down, and not, as is the case with the best English lard, of the fat
which surrounds the kidneys. Mutton suet, being a hard and firm fat, im-
s to soft lards, even when added in very small quantities, the consistence
solidity requisite.

appears, therefore, that water, starch, potash, alum, and caustic lime, have
een ascertained to be employed in the adulteration of lard. To these sub-
es we may add the following:—carbonate of soda, carbonate of potash,
salt. The whole of the above adulterations may be readily discovered.

he first thing to be done in order to ascertain whether a lard be genuine
dulterated, is to melt it at about a temperature of 212° Fahr. If it dissolve
out ebullition or without the occurrence of a deposit, we may safely con-
e that the sample is genuine; but if ebullition take place, or a sediment is
wn down, the lard is unquestionably adulterated.

he adulteration with water, and the quantity present, may be thus deter-
ed:—A known weight of lard is to be exposed to heat until bubbles of vapour
se to escape; the loss indicates the per-centage of water.

The presence of starch may be discovered by thoroughly incorporating a solu-
n of iodine with a few grains of the lard, placed upon a slip of glass; the lard
l change colour, and become deep blue, or almost black. If now a little of
s be viewed under the microscope, the starch-corpuscles will themselves be
n coloured by the iodine.

To determine the kind of starch contained in any sample, we must use the
roscope. A minute piece of the lard should be placed on a glass slide, pre-
usly thoroughly warmed; the moment the lard is melted it must be viewed
the object-glass, when the starch-corpuscles will be distinguished standing
as clearly as though they were in water.

Another way in which the starch-corpuscles may be well seen by the micro-
pe, is to spread out by gentle pressure, between two pieces of glass, a very
stratum of the lard.

lthough it is easy enough to detect starch in lard, it is by no means so to
mate the amount present.

ther does not readily dissolve lard, particularly in cold weather, owing to the
rine of the lard being then in a more firmly crystalline condition, so that by
reagent it is very difficult to separate all the lard from the other ingredients
which it may be admixed. If, however, ether be used for the purpose, the
should be melted, a little warm distilled water added, and lastly, while still
rn, the ether should be poured upon it; we may then weigh, when properly
d, either the oil obtained, or the sediment left. Still, with every precaution,
method of separation is very troublesome, and often fails.

nother method is as follows:—Put one hundred grains of the lard in a wide-
thed test-tube of known weight; heat below the boiling point of water until
escape of vapour ceases, and weigh again when cold. Fill nearly up with
er; heat as before; allow the oil which has risen to the surface to become
d; collect; heat again with a little more water, when a second portion of oil
l be obtained; add the two portions together, dry, and weigh.

Although this method is simple, it is very troublesome, and gives only approxi-
te results, since it is almost impossible to separate all the oil by heat alone.

For the determination of the saline matters sometimes present, it is in most
es sufficient to melt the lard, collect the precipitates, free them from oil with

Some years since a Treasury minute was issued legalising the adulteration of coffee with chicory. This legalisation of adulteration gave rise to almost every species and degree of fraud and sophistication in these articles; and although it was long notorious that it was next to impossible to obtain coffee in a genuine state, yet as it was difficult, and even until recently considered impossible to obtain satisfactory evidence of these adulterations, nothing effectual could be done to get this most objectionable and demoralising Treasury minute rescinded.

About two years since, however, the reports of this Commission supplied the evidence which was wanting. These reports showed conclusively that by a knowledge of structural botany, combined with the use of the microscope, the whole of the adulterations practised upon chicory and coffee could be clearly and unmistakeably brought to light. They proved that it was scarcely possible to obtain in this great and rich city such an article as genuine ground coffee; that not only was it almost constantly extensively adulterated with chicory, burnt sugar, or black-jack, but that chicory itself was also enormously adulterated with roasted carrots, parsnips, mangel-wurzel, beans, a kind of lupine seeds, wheat, rye, dog and spoiled ship-biscuit, burnt sugar, acorns, exhausted tan, mahogany sawdust, an article called Coffina, and some red earth, probably reddle or Venetian red.

At length the evidence adduced became so accumulated and conclusive that it was impossible longer to resist it. The Chancellor of the Exchequer under Lord John Russell, Sir Charles Wood, did indeed do his utmost, and this not without considerable misrepresentation of facts, to prevent any alteration in the law: and in this object he was for a time successful. The Government which succeeded took the question up in a different spirit and with more correct views. The Chancellor under Lord Derby's Administration, Mr. Disraeli, publicly announced the resolution to withdraw the Treasury minute. Before this long-desired object could be fully effected, however, a change of Government once more occurred, and with it a change of policy on the subject of chicory. The present Chancellor of the Exchequer, Mr. Gladstone, hit upon another and certainly a novel method of dealing with the question. He does not object to the mixture of chicory with coffee, but simply stipulates that this mixture shall be sold in packages having the words "mixture of chicory and coffee" printed on the outside, a penalty for the omission of the words in question of the sum of one hundred pounds being incurred, and the law within the last few months has been altered to meet these views.

The object of the present report is to ascertain whether the law, as thus altered, either protects the honest trader or secures the interests of the public; without therefore attempting to consider what the probable operation of this change would be, we will at once proceed to record the results of some new analyses.

RESULTS OF THE EXAMINATION, MICROSCOPICAL AND GENERAL, OF THIRTY-FOUR SAMPLES OF GROUND COFFEE AS PURCHASED OF VARIOUS DEALERS RESIDENT IN THE METROPOLIS.

The purchasers of the samples asked in each case to be supplied with COFFEE.

1st Sample.—Purchased of Messrs. Barber & Co., 141. Lower Marsh, Lambeth.

Adulterated. This sample contains about one-third *chicory*.

2nd Sample.—Purchased of Messrs. Weller & Co., 4. Horace-terrace, Walworth-road.

Adulterated. Contains about one-third *chicory*.

3rd Sample.—Purchased of Messrs. Bushby & Co., late Dannan & Co., 2. Staverton-row, Walworth-road.

Adulterated. Contains much *chicory*.

4th Sample.—Purchased of J. W. Canton, 4. Newington-causeway.

Adulterated. Consists of *chicory* and coffee in about equal proportions.

5th Sample.—Purchased of Mitchell & Co., 17. Blackman-street, Borough.

Adulterated. Contains about one-half *chicory*.

6th Sample.—Purchased of W. Bourne, 109. Blackman-street, Borough.

Adulterated. Contains about one-half *chicory*.

Some years since a Treasury minute was issued legalising the adulteration of coffee with chicory. This legalisation of adulteration gave rise to almost every species and degree of fraud and imposition in these articles; and although it was [illegible] that it was next to impossible to obtain coffee in a genuine [illegible] difficult and even until recently considered impossible to [illegible] of these adulterations, nothing effectual could be [illegible] legalising Treasury minute rescinded.

[illegible] the reports of this Commission supplied the [illegible] These reports showed conclusively that by a [illegible] with the use of the microscope, the [illegible] chicory and coffee could be clearly [illegible] They proved that it was scarcely possible [illegible] an article as genuine ground coffee; [illegible] extensively adulterated with chicory, [illegible] itself was also enormously adulterated [illegible] mangel-wurzel, beans, a kind of lupine seeds, [illegible] burnt sugar, acorns, exhausted [illegible] and some red earth, probably [illegible] Venetian red.

[illegible] became so accumulated and conclusive that it [illegible] The Chancellor of the Exchequer under [illegible] Sir Charles Wood did indeed do his utmost, and this not [illegible] misrepresentation of facts, to prevent any alteration in the [illegible] was for a time successful. The Government which [illegible] a different spirit and with more correct views. The Chancellor under Lord Derby's Administration, Mr. Disraeli, publicly [illegible] the Treasury minute. Before this long-[illegible] effected, however, a change of Government once more occurred, and with it a change of policy on the subject of chicory. The present Chancellor of the Exchequer, Mr. Gladstone, hit upon another and certainly a novel method of dealing with the question. He does not object to the mixture of chicory with coffee, but simply stipulates that this mixture shall be sold in packages having the words "mixture of chicory and coffee" printed on the outside, a penalty for the omission of the words in question of the sum of one hundred pounds being incurred, and the law within the last few months has been altered to meet these views.

The object of the present report is to ascertain whether the law, as thus altered, either protects the honest trader or secures the interests of the public; without therefore attempting to consider what the probable operation of this change would be, we will at once proceed to record the results of some new analyses.

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Adulterated. This sample contains about one-third *chicory.*

2nd Sample. — Purchased of Messrs. Weller & Co., 4, Horace-terrace, Walworth-road.

Adulterated. Contains about one-third *chicory.*

3rd Sample. — Purchased of Messrs. Bushby & Co., late Danuan & Co., 2, Staverton-row, Walworth-road.

Adulterated. Contains much *chicory.*

4th Sample. — Purchased of J. W. Canton, 4, Newington-causeway.

Adulterated. Consists of *chicory* and coffee in about equal proportions.

5th Sample. — Purchased of Mitchell & Co., 17, Blackman-street, Borough.

Adulterated. Contains about one-half *chicory.*

6th Sample. — Purchased of W. Bourne, 109, Blackman-street, Borough.

Adulterated. Contains about one-half *chicory.*

. — Purchased of G. Izod, 180. High-street, Borough.
ted. Consists of about equal quantities of *chicory* and coffee.
. — Purchased of Harris & Co., 91. High-street, Borough.

. — Purchased of D. Plant, 76. High-street, Borough.

le. — Purchased of Messrs. White & Fairchild, 63. High-street,
h.
ted. Consists of about equal proportions of *chicory* and coffee.
le. — Purchased of W. Sentance, 52. Blackman-street, Borough.

le. — Purchased of J. Grainger, Borough.
ted. Contains full one-half *chicory*, which is very gritty from the
ce of much sand or earthy matter.
le. — Purchased of R. Jones, 16. Borough.
ted. Contains about one-half *chicory*.
le. — Purchased of G. Maidman, 122. Lower Marsh, Lambeth.
for the most part of *chicory*.
le. — Purchased of H. Hoole, 44. London-road, Southwark.
of about one-third *chicory*.
le. — Purchased of G. Maidman, 124. Lower Marsh, Lambeth.
ple consists of a mixture of *chicory* and coffee in equal proportions.
le. — Purchased of Messrs. Dovenor & Co., 77. Lower Marsh,
th.
about one-third *chicory*.
le. — Purchased of J. Diplock, 50. Lower Marsh, Lambeth.
about equal quantities of *chicory* and coffee.
le. — Purchased of Messrs. Haynes & Co., Lower Marsh, Lambeth.
of full one-half *chicory*.
le. — Purchased of W. Jennings, 22. Lower Marsh, Lambeth.
ple consists of nearly one-half *chicory*.
le. — Purchased of Field & Co., 9. Walworth-road.
of about one-half *chicory*.
le. — Purchased of C. Woodroffe, 4. Crown-row, Walworth-road.
of a mixture of *chicory* and coffee, the former constituting the chief
n of the article.
le. — Purchased of Messrs. Lindsey & Co., 1. Waterloo-road.
ple consists of full one-half *chicory*.
le. — Purchased of Messrs. Pinnock & Co., 102. London-road.
ll *chicory*.
le. — Purchased of Horwood & Co., 69. Newington-causeway.
chicory and coffee in nearly equal proportions.
le. — Purchased of Messrs. Walker & Co., 84. Blackman-street, Borough.
of about half *chicory*.
le. — Purchased of J. Pringle, 35. Blackman-street, Borough.
an one-half of this sample consists of *chicory*.
le. — Purchased of Messrs. Brocksopp, Sons, & Co., 234. Borough.
ple contains nearly as much *chicory* as coffee.
le. — Purchased of J. Rose & Co., 213. Borough.
of *chicory* and coffee in about equal proportions.
le. — Purchased of Russell & Co., 72. High-street, Borough.
ory in this sample forms about one-third of the article.
le. — Purchased of Messrs. Harrington & Lucas, 113. High-street,
gh.
about equal proportions of *chicory* and coffee.
le. — Purchased of Russell & Co., 42. High-street, Borough.
s about one-third *chicory*.
le. — Purchased of Newsom & Williams, 50. High-street, Borough.
of about one-half *chicory*.
le. — Purchased of White & Co., 107. Borough.
of a mixture of *chicory* and coffee, the former constituting full one-
f the article.

Results of the Examination, Microscopical and General, of F four Samples purchased as Ground Coffee of various Dealers dent in the Metropolis.

The purchasers of the samples asked, in each instance, to be supplied Coffee.

1*st Sample.* —Purchased of Messrs. Barber & Co., 141. Lower Marsh, Lam
Adulterated. This sample contains about one-fourth *chicory.*

In making this purchase the question was asked, "Will you have the gen or mixed?" Answer, "Genuine."

2*nd Sample.* — Purchased of G. Maidman, 122. Lower Marsh, Lambeth.
Contains nearly two-thirds *chicory.*
3*rd Sample.* — Purchased of H. Leake, 16. Lower Marsh, Lambeth.
Contains about one-fourth *chicory.*
4*th Sample.* — Purchased of G. Maidman, 124. Lower Marsh, Lambeth.
This sample consists of a mixture of *chicory* and coffee, the former constitu nearly two-thirds of the article.
5*th Sample.* — Purchased of Messrs. Dovenor & Co., 77. Lower Marsh, Lamb
Contains about one-half *chicory.*
6*th Sample.* — Purchased of J. Diplock, 50. Lower Marsh, Lambeth.
Contains about equal quantities of *chicory* and coffee.
7*th Sample.* — Purchased of Messrs. Haynes & Co., 84. Lower Marsh, Lamb
Consists of about one-third *chicory.*
8*th Sample.* — Purchased of W. Jennings, 22. Lower Marsh, Lambeth.
This sample consists of nearly one-half *chicory.*
9*th Sample.* — Purchased of Messrs. Lindsey & Co., 1. Waterloo-road.
This sample consists of nearly one-half *chicory.*
10*th Sample.* — Purchased of H. Hoole, 44. London-road, Southwark.
Consists of full one-half *chicory.*

In purchasing this sample the remark was made, "You are aware tha cheapest coffee is a mixture."

11*th Sample.* — Purchased of Messrs. Pinnock & Co., 102. London-road, S wark.
Contains considerably more than one-half *chicory.*
12*th Sample.* — Purchased of Messrs. Weller & Co., 4. Horace-terrace, worth-road.
Contains considerably more than one-half *chicory.*
13*th Sample.*— Purchased of Messrs. Fisher & Co, 24. Crown-row, Wal road.
Consists of nearly three-fourths *chicory.*
14*th Sample.* — Purchased of C. Woodroffe, 4. Crown-row, Walworth-roa
Consists of a mixture of *chicory* and coffee, the former constituting mor one-third of the article.
15*th Sample.* — Purchased of Messrs. Field & Co., 9. Walworth-road.
Consists of about one-half *chicory.*
16*th Sample.* — Purchased of Messrs. Bushby & Co., late Dannan & 2. Staverton-row, Walworth-road.
Genuine.

In making this purchase the question was asked, "Will you have it ge or mixed?" Answer, "Coffee." The names on the wrapper are Bushby late Dannan & Co., while over the door is the name of Phillips.

17*th Sample.* — Purchased of J. W. Dixon, 1. Staverton-row, Walworth-r
Genuine.
18*th Sample.* — Purchased of J. W. Canton, 4. Newington-causeway.
Consists of *chicory* and coffee, the former constituting about one-fourth article.
19*th Sample.* — Purchased of Messrs. Horwood & Co., 69. Newington-cau
Contains *chicory* and coffee in nearly equal proportions.
20*th Sample.* — Purchased of W. Bourne, 109. Blackman-street, Borough
Contains about one-half *chicory.*

will now offer a few general considerations on the bearings of this new
ion regarding the sale of mixed chicory and coffee.

would first ask, what is the object of permitting the sale of these two
istinct articles in a mixed state? If the purpose be a legitimate one, it
surely be answered as well by directing that the two things should be sold
tely, leaving the choice of the use of chicory, and of the proportions in
se, to the consumer. But the real purpose is evidently neither fair nor
ate. It is done with a view to create an artificial sale for chicory, for
efit of the growers of that article and the retail and adulterating grocer,
is, too, at the expense of the fair trader, the revenue, and of our own
growing colonies.

"mixture of chicory and coffee" may consist of these articles in every
tion, as from fifteen or twenty per cent. to ninety-five per cent.; from, in
pinch of coffee to a pound of chicory.

trader disposed to adulterate his goods naturally argues, that since the
ment authorises the mixture of chicory and coffee, on the plea that
is good and wholesome, he, too, could not be much to blame, if, in
on of such high authority, he were to invent on a similar plea some nice
nixtures of his own for his customers; as, for example, a mixture of
rice, sago-powder, or linseed-meal and pepper, to diminish the fiery and
us action of the latter article on the delicate coats of the stomach; or of
d with flour, to lessen its pungency and acrimony.

n, the new regulation supposes that every person—man, woman, and
-purchasing coffee can read, and yet we know that a very large proportion
inhabitants even of our cities and towns are unable to read; and when we
remote country districts, this proportion is much greater. It must be re-
red likewise that the Treasury Order applies to the whole of the United
om. Of what use then are the words "mixture of chicory and coffee,"
at protection do they afford to the Irishman or Welshman, acquainted
ith his native tongue?

last scheme, then, for the regulation of the sale of chicory and coffee is
nned by reason, by right, and, as this report incontestably proves, by its
al operation.

COFFEE, AND ITS ADULTERATIONS.

MAY 21st, 1853.

formity with the notification given a short time since, we once more revert
consideration of the subject of Coffee and its Adulterations, with the object
particularly of examining the practical working of the Treasury order
y issued, legalising the sale of mixed chicory and coffee.

ill be remembered that it was clearly proved, from the investigations
ed in our report of April 23rd, that this order was an utter failure, either
rded the producer, the consumer, or the honest vendor. We have thought
able, however, to adduce still further evidence of its inefficiency, espe-
ince this vexed question has again assumed a different aspect.

had at first proposed to ourselves to have given the results of the exami-
of samples of coffee obtained from dealers resident in a totally different
the metropolis; on reconsideration, however, it appeared to us that it
be both interesting and important to ascertain, as nearly as possible, what
n the effect produced by our recent exposures. With this view we have
d samples from the very same parties whose names and addresses were
ed in the last report of the Commission. The districts visited, it will be
ted, were Lambeth, Newington, Walworth, and the Borough. Following
main and continuous thoroughfares, we have taken the same course on
sent occasion, extending the purchases to King William-street, Cheap-
d Ludgate-hill.

large cells, resembling receptacles; next in order from without inwards i layer of small cells, deeply coloured; next to these succeed the cells which constitute the principal part of the seed; these for the most part resemble clos the cells of pepper, being very angular, but they differ in their more delica and transparent appearance, and in being minutely dotted. *Fig.* 140. *B.*

Dr. Pereira, in his "Materia Medica," quotes the statement made by Schleiden that he has discovered in the cells of cardamom "amorphous, paste-like starch." We find the cells to be completely filled with minute, distinctly-formed starch granules, resembling closely those of rice. Probably the statement of Schleiden arose from his having employed but a feeble magnifying power in examination of the seeds.

The presence of cardamom seeds in curry-powder is most readily determined by means of the dotted and angular cells which form the substance of the seeds.

To the taste, cardamom seeds are sharp, warm, aromatic, and very like camphor. They contain both a fixed and volatile oil; but their chief properties ar due to the presence of the latter.

CUMMIN SEEDS.

The Cummin plant (*Cuminum Cyminum*) belongs, like Coriander, to the natural order Umbelliferæ; it is a native of Upper Egypt, but is extensively cultivated in Sicily and Malta.

Cummin seeds resemble somewhat caraway seeds, but they are larger, straighter, and of a lighter colour. The fruit is double, like that of coriander an all other umbelliferous plants, consisting of two seeds or mericarps; each mericarp has five *primary* ridges, which are filiform; and four *secondary* ridges which are prominent; but both are furnished with very fine hairs or prickles and under each secondary ridge is a receptacle or vitta.

Transverse sections of a cummin seed exhibit the following structure:—

The hairs or prickles are composed of cells, the long diameters of which ar arranged in the long axes of the hairs. The husk or covering of the seed is made up of numerous rounded or angular cells, in the midst of which the larg and triangular vittæ are situated; and between the husk and seed itself, there usually a small space, which is formed by the contraction of the seed after it ha arrived at maturity. The surface of the seed is of a pale brown colour, and i interior whitish and transparent. The exterior portion of the seed is constituted of elongated and flattened cells of a brownish colour, while the interior a chief substance of the seed itself is composed of numerous distinct, angu cells, the walls of which are thick and perfectly transparent; their conte consist principally of oil. The seeds do not contain starch. *Fig.* 141.

Cummin seeds possess a very peculiar, medicinal taste and smell, and it is t these that curry-powder owes the greater part of its characteristic flavour an odour.

FŒNUGRECK SEEDS.

Fœnugreck seeds are the produce of *Trigonella Fœnum Græcum*, one of t family Leguminosæ, or pea-tribe.

It is an annual plant, bearing yellow flowers, and grows principally in Ind Arabia, Sicily, and Montpelier.

The taste of the ground seeds is peculiar, but at the same time raw, and som what like that of beans; it is to these seeds that the characteristic flavour curry-powder is in part due.

According to Mr. Gray, the seeds are used by the inhabitants of the Ea Indies in cases of dysentery, and by the Arabs as a poultice for wounds. England they are employed in veterinary medicine, but chiefly as an ingredie in curry-powder.

The seeds contain a large quantity of mucilage, and hence their infusion a decoction are demulcent.

The structure of Fœnugreck seeds is very characteristic. The husk of t seed consists of three membranes; the outer is formed of a single layer of cel which bear a remarkable resemblance in shape to a short-necked bottle; t

mple.— Purchased of Messrs. Walker & Co., 84. Blackman-street,
ough.
ins full one-third *chicory*.
mple.—Purchased of W. Sentance, 52. Blackman-street, Borough.
ine.
mple.—Purchased of J. Pringle, 85. Blackman-street, Borough.
y two-thirds of this sample consist of *chicory*.
mple.—Purchased of Mitchell & Co., 17. Blackman-street, Borough.
ins about one-half *chicory*.
mple.—Purchased of G. Izod, 180. High-street, Borough.
sts of about equal quantities of *chicory* and coffee.
mple.—Purchased of Messrs. Underwood & Co., 147. High-street,
ough.
ins nearly one-third *chicory*.

and the following sample were bought separately, the question being
the purchaser in each case whether he wished it "pure" or "mixed."
wer in the one case was "Pure;" in the other "Mixed."

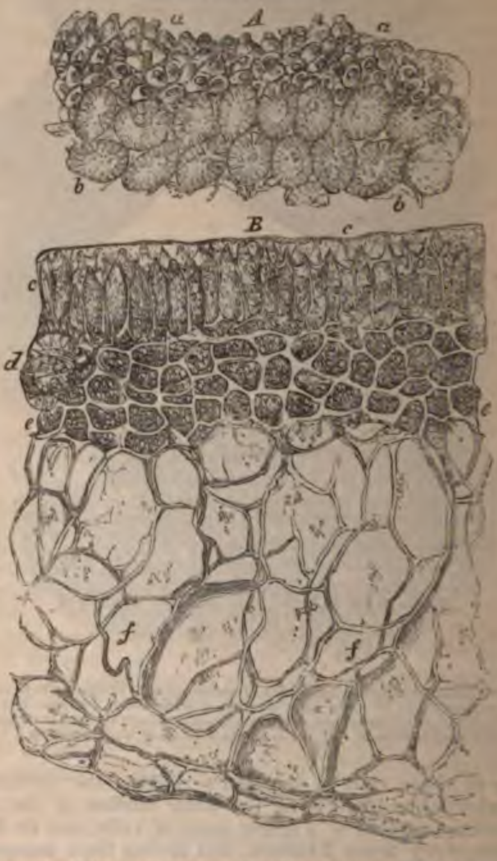
mples.—Purchased of Messrs. Underwood & Co., 147. High-street,
ough.
ne.
mple.—Purchased of Messrs. Harrington & Lucas, 113. High-street,
ough.
ne.
mple.—Purchased of Messrs. Harris & Co., 91. High-street, Borough.
ne.
mple.—Purchased of D. Plant, 76. High-street, Borough.
ne.
mple.— Purchased of Messrs. Russell & Co., 72. High-street, Borough.
icory in this sample forms nearly one-half of the article.
mple.—Purchased of Messrs. White & Fairchild, 63. High-street,
ough.
sts of nearly equal proportions of *chicory* and coffee.
mple.—Purchased of Messrs. Newsom & Williams, 50. High-street,
ough.
ne.
mple.— Purchased of Messrs. Russell & Co., 42. High-street, Borough.
ins scarcely one-fifth *chicory*.
mple.— Purchased of J. Grainger, 64. Borough.
ne.
mple.— Purchased of Messrs. Brocksopp, Sons, & Co., 234. Borough.
ne.
mple.— Purchased of J. Rose & Co., 213. Borough.
ts of *chicory* and coffee, the former constituting more than one-third of
article.
mple.— Purchased of R. Jones, 16. Borough.
ne.
mple.— Purchased of Messrs. White & Co., 107. Borough.
ts of a mixture of *chicory* and coffee, the former constituting more than
third of the article.
mple.— Purchased of Messrs. Phillips & Co., King William-street, Lon-
bridge.
ne.
ple.—Purchased of Messrs. Ridgway & Co., King William-street, Lon-
bridge.
ne.
mple.— Purchased of Messrs. Freshwater & Co., Poultry, Cheapside.
ne.
mple.— Purchased of Messrs. Dakin & Co., 1. St. Paul's-churchyard.
ne.
ple.— Purchased of Messrs. Sidney & Wells, Ludgate-hill.
ne.

present. It is only when the quantity of iron detected is greatly above ordinarily contained in genuine curry-powder, that we can safely prono the sample to be adulterated with that metal.

Fig. 142.

OUTER COAT OR TESTA OF A FŒNUGREEK SEED.

(Magnified 220 diameters.)



A. Portion of the outer and second membrane stripped off; *a a*, peculiar bottle-like cells; *b b*, crenated cells of second membrane. *B.* Transverse section of husk of seed; *c c*, bottle-like cells; *d*, position of crenated cells; *e e*, layer of coloured cells merging into *f f*, the large cells which form the innermost membrane, filled with mucilage.

RESULTS OF THE MICROSCOPICAL AND CHEMICAL ANALYSIS OF TWEN SAMPLES OF

CURRY-POWDER,

PURCHASED AT THE ESTABLISHMENTS OF VARIOUS GROCERS AND OILMEN I METROPOLIS.

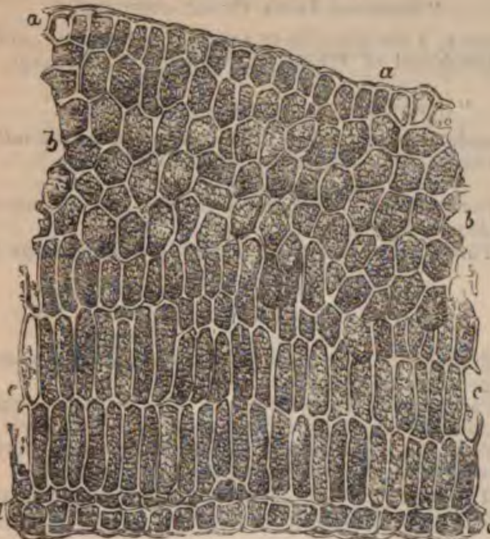
1*st Sample.*—Purchased of W. M. Nicholson, 86. Upper-street, Islington. *Contains* a small quantity of *salt*.

2*nd Sample.*—Purchased of Gluckner & King, 17. Mount-row, Islington. *Contains* very much *ground rice*.

Fig. 143.

TRANSVERSE SECTION OF LOBE OF FŒNUGREEK SEED.

(Magnified 220 diameters.)



a a. Layer of small angular cells on the surface. *b.* Rounded or angular cells. *c.* The same cells gradually becoming more elongated as they approach the inner part of lobe. *d.* Single row of cells forming the innermost margin of lobe.

3rd Sample.—Purchased of H. Davis & Co., 23. High-street, Islington.
Contains a proportion of *ground rice.*

4th Sample.—Purchased of C. Young, 8. High-street, Islington.
Genuine.

5th Sample.—Purchased of Beckett & Young, 3. High-street, Islington.
Genuine.

6th Sample.—Purchased of C. Roads, 11. Black Prince-row, Walworth.
Contains a proportion of *ground rice.*

7th Sample.—Purchased of W. Bourne, 109. Blackman-street, Borough.
Genuine, but consists principally of *turmeric-powder* and *cayenne.*

8th Sample.—Purchased of S. Jackson, 75. Blackman-street, Borough.
Contains a very small quantity of *salt.*

9th Sample.—Purchased of J. North, 135. High-street, Borough.
Contains a small proportion of *salt.*

10th Sample.—Purchased of Harrington and Lucas, 113. High-street, Borough.
Contains RED-LEAD and *salt.*

11th Sample.—Purchased of G. Pike, 77. High-street, Borough.
Contains very much *ground rice.*

12th Sample.—Purchased of Way & Co., 272. Oxford-street.
Contains a considerable quantity of RED-LEAD.

13th Sample.—Purchased of R. Drewe, 118. Tichfield-street.
Contains a considerable quantity of RED-LEAD, and a little *salt.*

14th Sample.—Purchased of J. Edwards, 10. Cambridge-street, Golden-square.
Genuine.

15th Sample.—Purchased of J. Bishopp, 51. Brewer-street, Golden-square.
Contains an immense quantity of *ground rice.*

16th Sample.—Purchased of R. C. Hall, 72. Princes-street, Leicester-square.
Contains RED-LEAD and a small quantity of *salt.*

15th Sample. — Purchased of S. Garratt, 6. Whitechapel-road.
Analysis. — 100 parts consist of 14·53 *water*, 5·00 *salt*, and 80·47 *butter.*
16th Sample. — Purchased of J. Griggs, 123. Brick-lane, Spitalfields.
Analysis. — 100 parts consist of 14·36 *water*, 3·71 *salt*, and 81·93 *butter.*
17th Sample. — Purchased of R. W. Ormston, 116. Brick-lane, Spitalfields.
Analysis. — 100 parts consist of 13·73 *water*, 4·25 *salt*, and 82·02 *butter.*
18th Sample. — Purchased of J. Hooker, 18. Brick-lane, Spitalfields.
Analysis. — 100 parts consist of 16·46 *water*, 5·96 *salt*, and 77·58 *butter.*
19th Sample. — Purchased of J. Naylor, 9. Osborne-street, Whitechapel.
Analysis. — 100 parts consist of 16·91 *water*, 3·87 *salt*, and 79·22 *butter.*
20th Sample. — Purchased of J. Naylor, 9. Osborne-street, Whitechapel.
Analysis. — 100 parts consist of 26·22 *water*, 5·53 *salt*, and 68·25 *butter.*
21st Sample. — Purchased of J. H. Crump, 59. Hackney-road.
Analysis. — 100 parts consist of 15·00 *water*, 4·00 *salt*, and 81·00 *butter.*
22nd Sample. — Purchased of G. Edwards, 187. Kingsland-road.
Analysis. — 100 parts consist of 13·10 *water*, 3·32 *salt*, and 83·58 *butter*
23rd Sample. — Purchased of G. Deane, 1. Cross-street, Hoxton New Tow
Analysis. — 100 parts consist of 12·07 *water*, 8·24 *salt*, and 79·69 *butter.*
24th Sample. — Purchased of G. Webb, 234. Shoreditch High-street.
Analysis. — 100 parts consist of 28·60 *water*, 3·68 *salt*, and 67·72 *butter.*
25th Sample. — Purchased of J. F. Brooks, 160. Shoreditch.
Analysis. — 100 parts consist of 12·69 *water*, 7·12 *salt*, and 80·19 *butter.*
26th Sample. — Purchased of H. Dennis, 141. Shoreditch, High-street.
Analysis. — 100 parts consist of 17·48 *water*, 4·94 *salt*, and 77·58 *butter.*
27th Sample. — Purchased of J. Tate, 118. Shoreditch, High-street.
Analysis. — 100 parts consist of 21·61 *water*, 2·00 *salt*, and 76·39 *butter.*
28th Sample. — Purchased of C. Peowrie, 23. Church-street, Shoreditch.
Analysis. — 100 parts consist of 14·70 *water*, 5·17 *salt*, and 80·13 *butter.*
29th Sample. — Purchased of Messrs. Cory & Williamson, 177. Bishopsgate-street Without.
Analysis. — 100 parts consist of 16·55 *water*, 3·85 *salt*, and 79·60 *butter.*
30th Sample. — Purchased of W. Carr, 151. Bishopsgate-street Without.
Analysis. — 100 parts consist of 14·44 *water*, 4·48 *salt*, and 81·08 *butter.*
31st Sample. — Purchased of Beck & Murley, 149. Bishopsgate-street Without.
Analysis. — 100 parts consist of 14·00 *water*, 2·73 *salt*, and 83·27 *butter.*
32nd Sample. — Purchased of Price & Son, 124. Bishopsgate-street Without.
Analysis. — 100 parts consist of 9·62 *water*, 3·10 *salt*, and 87·28 *butter.*
33rd Sample. — Purchased of Fitch & Son, 66. Bishopsgate-street Within.
Analysis. — 100 parts consist of 17·82 *water*, 6·16 *salt*, and 76·02 *butter.*

FRESH BUTTERS.

OSTEND.

34th Sample. — Purchased of T. Hunt, 100. Whitechapel-road.
Analysis. — 100 parts consist of 13·37 *water*, 1·60 *salt*, and 85·03 *butter.*
35th Sample. — Purchased of G. Webb, 234. Shoreditch, High-street.
Analysis. — 100 parts consist of 13·66 *water*, 1·54 *salt*, and 84·80 *butter.*
36th Sample. — Purchased of H. Dennis, 141. Shoreditch, High-street.
Analysis. — 100 parts consist of 12·49 *water*, 2·91 *salt*, and 84·60 *butter.*
37th Sample. — Purchased of Auckland & Needham, 191. Shoreditch, H street.
Analysis. — 100 parts consist of 12·60 *water*, 3·74 *salt*, and 83·66 *butter.*

This sample contains as much salt as many salt butters. The proportio salt in Sample 36 is also more considerable than is usual in Ostend butter.

38th Sample. — Purchased of R. Nettleship, 67. Shoreditch, High-street.
Analysis. — 100 parts consist of 14·70 *water*, 1·98 *salt*, and 83·32 *butter.*
39th Sample. — Purchased of W. Carr, 151. Bishopsgate-street Without.
Analysis. — 100 parts consist of 15·43 *water*, 1·30 *salt*, and 83·27 *butter.*
40th Sample. — Purchased of Beck & Murley, 149. Bishopsgate-street With
Analysis. — 109 parts consist of 11·53 *water*, 1·49 *salt*, and 86·98 *butter.*
41st Sample. — Purchased of Price & Son, 124. Bishopsgate-street Without.
Analysis. — 100 parts consist of 11·56 *water*, 0·98 *salt*, and 87·46 *butter.*

would be out of place in this report to enter into the practical minutiæ of r-making, such as the temperature at which the cream or milk should be ned, the best kinds of churn, the methods of churning, &c., all points of the test importance.

he oily or buttery part exists in milk in the form of innumerable, very dis-t globules, of various sizes. The effect produced by churning is to break n these globules, which then run together, and thus form butter. The ope-on of the churn is therefore chiefly, if not entirely, mechanical.

eferring to works treating on Food, we do not meet with any facts relating he adulteration of butter. We will now proceed to give the results of the yses which we have instituted.

ULTS OF THE MICROSCOPICAL AND CHEMICAL EXAMINATIONS OF FORTY-GHT SAMPLES OF BUTTER, BOTH FOREIGN AND HOME-MADE, AS IMPORTED, D AS PURCHASED OF RETAIL DEALERS.

FOREIGN BUTTER AS IMPORTED.

HOLLANDS.

Sample.

nalysis.—100 lbs. or parts consist of 17·07 *water*, 1·97 *salt*, and 80·96 parts of *butter*.

Sample.

nalysis.—100 parts consist of 17·69 *water*, 1·53 *salt*, and 80·78 *butter*.

Sample.

nalysis.—100 parts consist of 24·34 *water*, 4·37 *salt*, and 71·29 *butter*.

Sample.

nalysis.—100 parts consist of 18·89 *water*, 1·60 *salt*, and 79·51 *butter*.

Sample.

nalysis.—100 parts consist of 18·02 *water*, 3·94 *salt*, and 78·04 *butter*.

BOSH.

Sample.

nalysis.—100 parts consist of 8·48 *water*, 3·31 *salt*, and 88·21 *butter*.

his sample, as well as samples 7 and 9, were not submitted to analysis until e time after they had been received, and it was evident, from their dried and tracted appearance, although contained in a wooden box, that they had lost a siderable part of their water. This is also shown to have been the case by results of the analyses. These analyses are instructive, then, as showing loss of weight which butter sustains by keeping.

Sample.

nalysis.—100 parts consist of 9·16 *water*, 2·50 *salt*, and 88·34 *butter*.

Sample.

nalysis.—100 parts consist of 15·60 *water*, 1·59 *salt*, and 82·81 *butter*.

OSTEND.

Sample.

nalysis.—100 parts consist of 4·18 *water*, 2·32 *salt*, and 93·50 *butter*.

TRALEE.

Sample.

nalysis.—100 parts consist of 0·25 *water*, 4·53 *salt*, and 95·22 *butter*.

AS OBTAINED FROM RETAIL DEALERS.

SALT BUTTERS.

Sample.

urchased of T. Hunt, 108, Whitechapel-road.

nalysis.—100 parts consist of 15·74 *water*, 4·94 *salt*, and 79·32 *butter*.

Sample.—Purchased of J. Reilly, 75, Whitechapel-road.

nalysis.—100 parts consist of 16·84 *water*, 5·61 *salt*, and 77·55 *butter*.

Sample.—Purchased of W. Corney, 55, Whitechapel-road.

nalysis.—100 parts consist of 14·69 *water*, 5·04 *salt*, and 80·27 *butter*.

Sample.—Purchased of E. Mellor, 36, Whitechapel-road.

nalysis.—100 parts consist of 16·44 *water*, 3·49 *salt*, and 80·07 *butter*.

15th *Sample.* — Purchased of S. Garratt, 6. Whitechapel-road.
Analysis. — 100 parts consist of 14·53 *water*, 5·00 *salt*, and 80·47 *butter.*
16th *Sample.* — Purchased of J. Griggs, 123. Brick-lane, Spitalfields.
Analysis. — 100 parts consist of 14·36 *water*, 3·71 *salt*, and 81·93 *butter.*
17th *Sample.* — Purchased of R. W. Ormiston, 116. Brick-lane, Spitalfields.
Analysis. — 100 parts consist of 13·73 *water*, 4·25 *salt*, and 82·02 *butter.*
18th *Sample.* — Purchased of J. Hooker, 18. Brick-lane, Spitalfields.
Analysis. — 100 parts consist of 16·46 *water*, 5·96 *salt*, and 77·58 *butter.*
19th *Sample.* — Purchased of J. Naylor, 9. Osborne-street, Whitechapel.
Analysis. — 100 parts consist of 16·91 *water*, 3·87 *salt*, and 79·22 *butter.*
20th *Sample.* — Purchased of J. Naylor, 9. Osborne-street, Whitechapel.
Analysis. — 100 parts consist of 26·22 *water*, 5·53 *salt*, and 68·25 *butter.*
21st *Sample.* — Purchased of J. H. Crump, 59. Hackney-road.
Analysis. — 100 parts consist of 15·00 *water*, 4·00 *salt*, and 81·00 *butter.*
22nd *Sample.* — Purchased of G. Edwards, 187. Kingsland-road.
Analysis. — 100 parts consist of 13·10 *water*, 3·32 *salt*, and 83·58 *butter*
23rd *Sample.* — Purchased of G. Deane, 1. Cross-street, Hoxton New Town.
Analysis. — 100 parts consist of 12·07 *water*, 8·24 *salt*, and 79·69 *butter.*
24th *Sample.* — Purchased of G. Webb, 234. Shoreditch High-street.
Analysis. — 100 parts consist of 28·60 *water*, 3·68 *salt*, and 67·72 *butter.*
25th *Sample.* — Purchased of J. F. Brooks, 160. Shoreditch.
Analysis.—100 parts consist of 12·69 *water*, 7·12 *salt*, and 80·19 *butter.*
26th *Sample.*— Purchased of H. Dennis, 141. Shoreditch, High-street.
Analysis.—100 parts consist of 17·48 *water*, 4·94 *salt*, and 77·58 *butter.*
27th *Sample.*—Purchased of J. Tate, 118. Shoreditch, High-street.
Analysis.—100 parts consist of 21·61 *water*, 2·00 *salt*, and 76·39 *butter.*
28th *Sample.*—Purchased of C. Peowrie, 23. Church-street, Shoreditch.
Analysis.—100 parts consist of 14·70 *water*, 5·17 *salt*, and 80·13 *butter.*
29th *Sample.*—Purchased of Messrs. Cory & Williamson, 177. Bishopsga
street Without.
Analysis.—100 parts consist of 16·55 *water*, 3·85 *salt*, and 79·60 *butter.*
30th *Sample.*—Purchased of W. Carr, 151. Bishopsgate-street Without.
Analysis.—100 parts consist of 14·44 *water*, 4·48 *salt*, and 81·08 *butter.*
31st *Sample.* — Purchased of Beck & Murley, 149. Bishopsgate-street Withou
Analysis. — 100 parts consist of 14·00 *water*, 2·73 *salt*, and 83·27 *butter.*
32nd *Sample.* — Purchased of Price & Son, 124. Bishopsgate-street Without.
Analysis. — 100 parts consist of 9·62 *water*, 3·10 *salt*, and 87·28 *butter.*
33rd *Sample.* — Purchased of Fitch & Son, 66. Bishopsgate-street Within.
Analysis. — 100 parts consist of 17·82 *water*, 6·16 *salt*, and 76·02 *butter.*

FRESH BUTTERS.

OSTEND.

34th *Sample.* — Purchased of T. Hunt, 100. Whitechapel-road.
Analysis. — 100 parts consist of 13·37 *water*, 1·60 *salt*, and 85·03 *butter.*
35th *Sample.* — Purchased of G. Webb, 234. Shoreditch, High-street.
Analysis. — 100 parts consist of 13·66 *water*, 1·54 *salt*, and 84·80 *butter.*
36th *Sample.* — Purchased of H. Dennis, 141. Shoreditch, High-street.
Analysis. — 100 parts consist of 12·49 *water*, 2·91 *salt*, and 84·60 *butter.*
37th *Sample.* — Purchased of Auckland & Needham, 191. Shoreditch, Hig
street.
Analysis. — 100 parts consist of 12·60 *water*, 3·74 *salt*, and 83·66 *butter.*

This sample contains as much salt as many salt butters. The proportio salt in Sample 36 is also more considerable than is usual in Ostend butter.

38th *Sample.*— Purchased of R. Nettleship, 67. Shoreditch, High-street.
Analysis. — 100 parts consist of 14·70 *water*, 1·98 *salt*, and 83·32 *butter.*
39th *Sample.* — Purchased of W. Carr, 151. Bishopsgate-street Without.
Analysis. — 100 parts consist of 15·43 *water*, 1·30 *salt*, and 83·27 *butter.*
40th *Sample.* — Purchased of Beck & Murley, 149. Bishopsgate-street Withou
Analysis. — 109 parts consist of 11·53 *water*, 1·49 *salt*, and 86·98 *butter.*
st Sample. — Purchased of Price & Son, 124. Bishopsgate-street Without.
Analysis. — 100 parts consist of 11·56 *water*, 0·98 *salt*, and 87·46 *butter.*

Sample. — Purchased of Fitch & Son, 66. Bishopsgate-street Within.
alysis. — 100 parts consist of 12·23 *water*, 0·84 *salt*, and 86·93 *butter*.
Sample. — Purchased of G. Edwards, 187. Kingsland-road.
alysis. — 100 parts consist of 18·70 *water*, 4·43 *salt*, and 76·87 *butter*.
is, although sold as fresh, is evidently a salt butter.

Sample. — Purchased of J. Barnett, 96. Leadenhall-street.
alysis. — 100 parts consist of 12·84 *water*, 6·44 *salt*, and 80·72 *butter*.
s, although sold as fresh, is likewise evidently a salt butter.

English.

Sample. — Purchased of C. Fenn, 27. Frith-street, Soho.
alysis. — 100 parts consist of 13·19 *water*, 0·36 *salt*, and 86·45 *butter*.
Sample. — Purchased of Webber & Son, 1. Brewer-street, Golden-square.
alysis. — 100 parts consist of 11·29 *water*, 0·64 *salt*, and 88·07 *butter*.
Sample. — Purchased of J. Howell, 53. Great Windmill-street.
alysis. — 100 parts consist of 13·16 *water*, 0·30 *salt*, and 86·54 *butter*.
Sample. — Purchased of J. H. Stocker, 42. Great Ryder-street, St. James's.
alysis. — 100 parts consist of 12·07 *water*, 0·07 *salt*, and 87·23 *butter*.

above results will be best understood as arranged in the following table: —

ESULTS OF THE ANALYSES OF FORTY-EIGHT SAMPLES OF DIFFERENT BUTTERS,

Arranged in a Tabular Form.

Names.	Water in 100 parts.	Salt in 100 parts.	Total Water and Salt.	Butter in 100 parts.	Remarks.
Hollands.	17·07	1·97	19·04	80·96	
Ditto.	17·69	1·53	19·22	80·78	
Ditto.	24·34	4·37	28·71	71·29	
Ditto.	18·89	1·60	20·49	79·51	
Ditto.	18·02	3·94	21·96	78·04	
Bosh.	8·48	3·31	11·79	88·21	Part of water lost by keeping.
Ditto.	9·16	2·50	11·66	88·34	Part of water lost by keeping.
Ditto.	15·60	1·59	17·19	82·81	
Ostend.	4·18	2·32	6·50	93·50	Part of water lost by keeping.
Tralee.	0·25	4·53	4·78	95·22	Unusually free from water.
T. Hunt.	15·74	4·94	20·68	79·32	Salt butter.
J. Reilly.	16·84	5·61	22·45	77·55	Ditto.
W. Corney.	14·69	5·04	19·73	80·27	Ditto.
E. Mellor.	16·44	3·49	19·93	80·07	Ditto.
S. Garratt.	14·53	5·00	19·53	80·47	Ditto.
J. Griggs.	14·36	3·71	18·07	81·93	Ditto.
R. W. Ormston.	13·73	4·25	17·98	82·02	Ditto.
J. Hooker.	16·46	5·96	22·42	77·58	Ditto.
Naylor.	16·91	3·87	20·78	79·22	Ditto.
Ditto.	26·22	5·53	31·75	68·25	Ditto.
J. H. Crump.	15·00	4·00	19·00	81·00	Ditto.
G. Edwards.	13·10	3·32	16·42	83·58	Ditto.
G. Denne	12·07	8·24	20·31	79·69	Ditto.
G. Webb.	28·60	3·68	32·28	67·72	Ditto.
J. F. Brooks.	12·69	7·12	19·81	80·19	Ditto.
H. Dennis.	17·48	4·94	22·42	77·58	Ditto.
J. Tate.	21·61	2·00	23·61	76·39	Ditto.
C. Peowrie.	14·70	5·17	19·87	80·13	Ditto.
Cory and Williamson.	16·55	3·85	20·40	79·60	Ditto.
W. Carr.	14·44	4·48	18·92	81·08	Ditto.
Beck and Murley.	14·00	2·73	16·73	83·27	Ditto.
Price and Son.	9·62	3·10	12·72	87·28	Ditto.
Fitch and Son.	17·82	6·16	23·98	76·02	Ditto.
T. Hunt.	13·37	1·60	14·97	85·03	Fresh butter, Ostend.
G. Webb.	13·66	1·54	15·20	84·80	Ditto.
H. Dennis.	12·49	2·91	15·40	84·60	Ditto. Larger proportion of salt than usual.
ukland and Needham.	12·60	3·74	16·34	83·66	Ditto. Much larger proportion of salt than usual.
R. Nettleship.	14·70	1·98	16·68	83·32	Fresh butter, Ostend.
W. Carr.	15·43	1·30	16·73	83·27	Ditto.
Beck and Murley.	11·53	1·49	13·02	86·98	Ditto.
Price and Son.	11·56	0·98	12·54	87·46	Ditto.
Fitch and Son.	12·23	0·84	13·07	86·93	Ditto.
G. Edwards.	18·70	4·43	23·13	76·87	Really salt, although sold as Ostend.
J. Barnett.	12·84	6·44	19·28	80·72	Really salt.
C. Fenn.	13·19	0·36	13·55	86·45	Sold as home-made fresh butter.
Webber and Son.	11·29	0·64	11·93	88·07	Ditto.
J. Howell.	13·16	0·30	13·46	86·54	Ditto.
J. H. Stocker.	12·07	0·70	12·77	87·23	Ditto.

TOBACCO, AND ITS ADULTERATIONS.

Tobacco consists of the dried leaves of several different species and varieties of plants belonging to the genus *Nicotiana*, of the family *Solanaceæ*, which includes, amongst other medicinal plants, hyoscyamus, belladonna, and stramonium.

The tobacco plant, according to Humboldt*, has been cultivated from time immemorial by the natives of Oronoko, but its introduction into Europe appears to have taken place subsequent to the discovery of America, although there is reason for believing that it was known to the Asiatics long before that time.

The custom of smoking cigars was beheld by Columbus and his followers for the first time on their arrival at Cuba in 1492.† The plant was afterwards introduced into Spain and Portugal by Hernandez de Toledo, and Joan Nicot about 1559-60 sent the seeds from the latter place to France.‡ On the return of Sir Francis Drake with the colonists from Virginia in 1586, the practice of smoking was introduced into England, and soon became general, Sir Walter Raleigh being one of the first to adopt it.§

Subsequent to its introduction into Europe, various attempts were made to prohibit the smoking and use of tobacco, but all the writings, pains, and penalties proved ineffectual, and the practice went on extending, until, as at present, it has become almost universal. One of the most celebrated of the treatises written against tobacco was the "Counterblaste to Tobacco,"∥ by King James the First.

In Great Britain the cultivation of tobacco is still restricted on account of the revenue, not more than half a pole (two yards and three-quarters) being allowed "in a physic or university garden, or in any private garden for physic or chirurgery."

The generic appellation of *Nicotiana* is evidently derived from Nicot, the name of the individual by whom the plant was first sent to France, while it is probable that the specific word *tabacum* given to one of the principal species, is derived from *tabac*, the name of the instrument used by the natives of America for smoking tobacco. Some, however, derive the word from Tobago, others from Tobasco, a town in New Spain.

The principal species of tobacco, and also that employed in medicine, is *Nicotiana Tabacum*, or *Virginian tabacco;* it is a herbaceous plant, reaching from three to six feet in height, with a viscid, gummy juice; the leaves are sessile, large, pale-green when fresh, oblong, lanceolate, acuminate, and clothed with short glandular hairs; it is extensively cultivated nearly all over the world, but chiefly in the United States of America, Virginia being the most celebrated for its growth.

Of this species several varieties are cultivated; Virginian, Kentucky, Maryland, and Columbian tobacco, are all obtained from it.

The leaves of *N. latissima* (Miller), *N. macrophylla* (Sprengel) yield the *large-leaved* or *Oronoko tobacco*. This is probably merely a variety of the preceding species; it likewise presents certain modifications or varieties dependent upon the size and form of the leaves, as also upon whether they are sessile, or furnished with leaf-stalks. According to Don the large Havannah cigars are probably made from the leaves of this species.

The leaves of the *N. rustica*, *common green tobacco*, furnish the tobacco of Salonica or Thessalonica; also the Turkish tobacco grown on the coasts of the Mediterranean, so highly valued in India; and probably also the celebrated Latakia. The leaves of this species are petiolate, ovate, and quite entire. It ripens earlier, and is more hardy than *N. Tabacum*. It is frequently cultivated

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* Personal Narrative, vol. v. p. 666.

† History of the Life and Voyages of Columbus, Washington Irving, vol. i. p. 287.

‡ Bauhin's Pinax.

§ Biograph. Brit. vol. v. p. 3471.

∥ Works, p. 214, f. 1616.

THE ANALYTICAL SANITARY COMMISSION.

BUTTER AND ITS ADULTERATIONS.

"*To the Editor of* THE LANCET.

—Being attracted to the article in your publication of June 4th, on the
eration of Butter,' by the conspicuous mention of my name, I take the
of stating that, although I believe in the fidelity of your analyses, there
things you are wrong in. First, the amount of adulteration in the worst
is stated to be twenty-six per cent. I account for this thus: The adulte-
process is to bring the butter to the melting point, then to stir it in water
until the mixture is cold. Fifty per cent. of water may be incorporated
tter in this way; but when you make your purchase, say half a pound,
derable part of the water of adulteration will escape, and if you put it in
onsiderably more will be lost. The next way you might be deceived is,
ask for Repacks (Irish) or Black Jacks, or Bosh (Holland), the shop-
may suspect your scientific object, and give you better butter instead;
he public adopt your suggestion of melting butter in a clear bottle, they
ove what I have above said, that twenty-six per cent. of adulteration in
utters is understating the amount.
e name of the trade, I may thank you for your article; because a neigh-
shop selling 'cheap butter' compels other shops to do so also; but the
re now aware of the iniquitous article, and are horrified by being thus
led to cheat their poor customers with '*cheap butter*,' while they are
rfectly aware of the great loss of weight to themselves by cutting up this
butter in small quantities. The trade would all be glad to give up the
adulterated butter if a public movement were made, so as to compel all
pkeepers to do so at the same time.

I am, Sir, yours truly,
ROBT. MILLER.

ton-chambers, London-bridge, June, 1853.

.—40,000 to 50,000 casks of adulterated butter are annually sold in
, and the trade knows it as well as they know a bad shilling."

EPPING BUTTER.

"*To the Editor of* THE LANCET.

—Having taken apartments in the house of a butterman, I was suddenly
at three o'clock one morning with a noise in the lower part of the house,
rmed on perceiving a light below the door of my bedroom: conceiving the
to be on fire, I hurried down stairs. I found the family busily occupied;
my expressing alarm at the house being on fire, they jocosely informed
ey were merely making EPPING BUTTER!
y unhesitatingly informed me of the whole process. For this purpose
ade use of Irish salted butter of a very inferior quality. This was
edly washed with water, in order to free it from the salt. This being
plished, the next process was to wash it frequently with milk, and the
acture was completed by the addition of a small quantity of sugar.
amateurs of fresh "Epping butter" were supplied with this dainty, which
d my ingenious landlord a profit at least one hundred per cent., besides
shing his shop as being supplied with Epping butter from one of the first-
airies.

I am, Sir, your obedient servant,
A STUDENT."

road, Lambeth, June, 1853.

from those of most other plants. These peculiarities can only be sa determined by means of the microscope, and it is very important should be clearly understood, for without a knowledge of them it is possible to discriminate between genuine and adulterated tobacco— the greatest consequence, since no less than about four millions a pounds sterling are derived annually from the duty on tobacco, and known that the revenue is defrauded to a large extent with compa punity by the adulteration of tobacco. Most leaves may be divided parts, the broad expanded part or lamina, and the mid-rib or stalk an they are called, which traverse this, imparting to it strength and soli same way as the bones of an animal.

The lamina is composed chiefly of cellular tissue, and the veins of w and vessels.

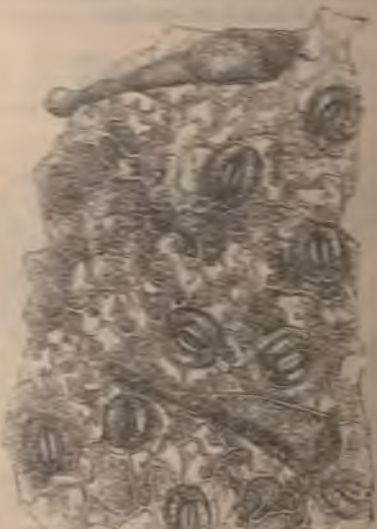
A minute fragment of tobacco-leaf, viewed on its upper surface with quarter-inch object-glass, is seen to consist of a number of cells, joi ther, and having smooth and waved borders, with here and there sto numerous hairs. These hairs are peculiar; they are of the kind term dular—that is, they terminate in a roundish swelling or enlargeme clearly seen even in the dried leaf; further, the hairs vary greatly in occasionally they are divided or compound. *Fig.* 145.

The under surface of the leaf presents a nearly similar structure, bu mata are much more numerous, and the hairs fewer. *Fig.* 146.

Fig. 146.

UNDER SURFACE OF LEAF OF TOBACCO.

(Magnified 220 diameters.)



The veins and mid-ribs, viewed in transverse sections are of a cresce horseshoe form. It has been considered by some that the stalks of tobacc always be distinguished from those of other plants by this characte appears, however, that sections of the stalks of stramonium and hyosc present a nearly similar outline; but these plants are scarcely likely used, under any circumstances, by the manufacturer, for the adulterat tobacco.

Transverse sections of the smaller veins under an inch object-glass *the* appearances shown in the following figure:—

Fig. 147.
TRANSVERSE SECTION OF MID-RIB OF LEAF OF TOBACCO.
(Magnified 40 diameters.)

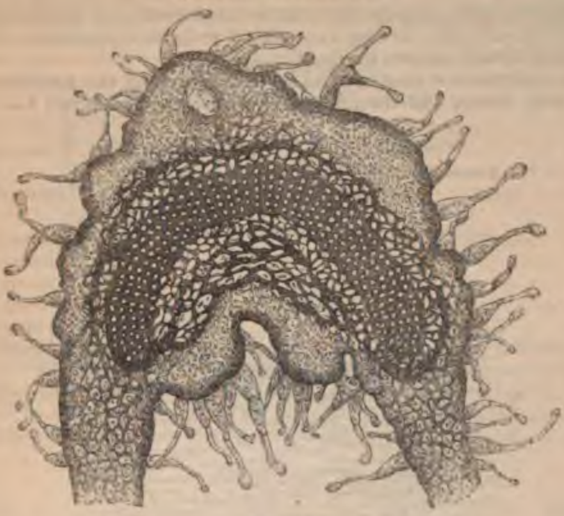
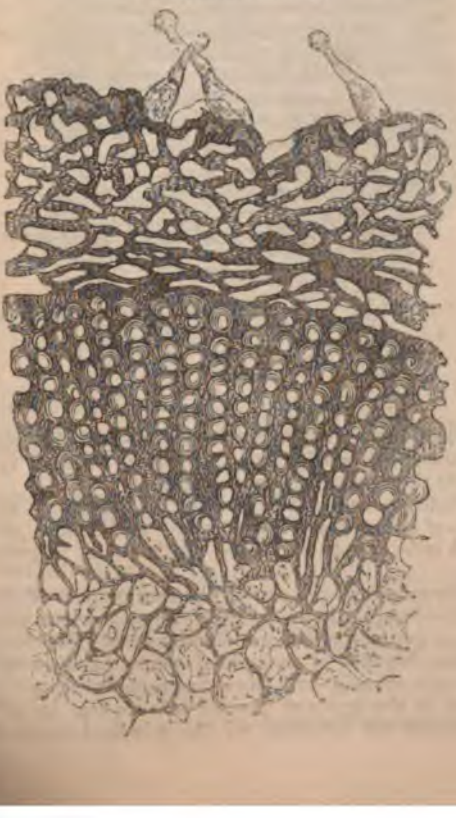


Fig. 148.
PORTION OF TRANSVERSE SECTION OF MID-RIB OF LEAF OF TOBACCO.
(Magnified 90 diameters.)



from those of most other plants. These peculiarities can only be se [illegible] by means of the microscope, and it is very importan [illegible] of them it is [illegible] adulterated tobacco— [illegible] millions a [illegible] tobacco, and [illegible] the extent with con [illegible] Most leaves may be divided [illegible] parts, [illegible] and the mid-rib or stalk [illegible] imparting to it strength and soli [illegible]

The [illegible] is composed chiefly of cellular tissue, and the veins of wo [illegible]

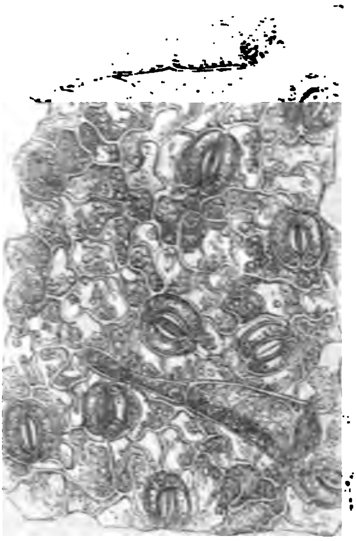
A minute fragment of tobacco-leaf, viewed on its upper surface with [illegible] glass, is seen to consist of a number of cells, join [illegible] them, and having smooth and waved borders, with here and there so [illegible] hairs. These hairs are peculiar; they are of the kind term [illegible]—that is, they terminate in a roundish swelling or enlargem [illegible] even in the dried leaf; further, the hairs vary greatly in s [illegible] they are divided or compound. *Fig.* 145.

The under surface of the leaf presents a nearly similar structure, bu [illegible] much more numerous, and the hairs fewer. *Fig.* 146.

Fig. 146.

Under Surface of Leaf of Tobacco.

Magnified [illegible] diameters.



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(Magnified 40 diameters.)

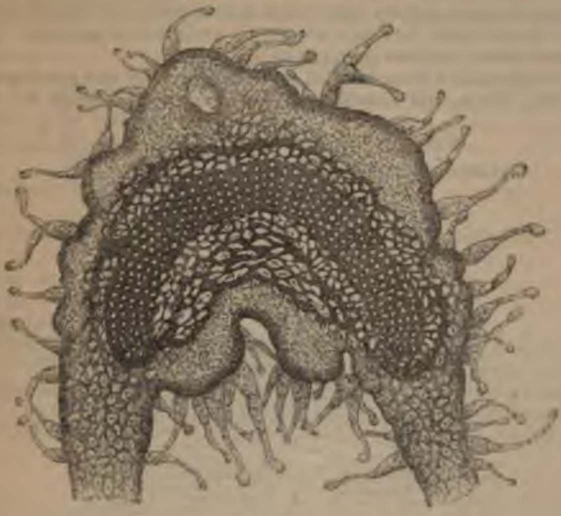
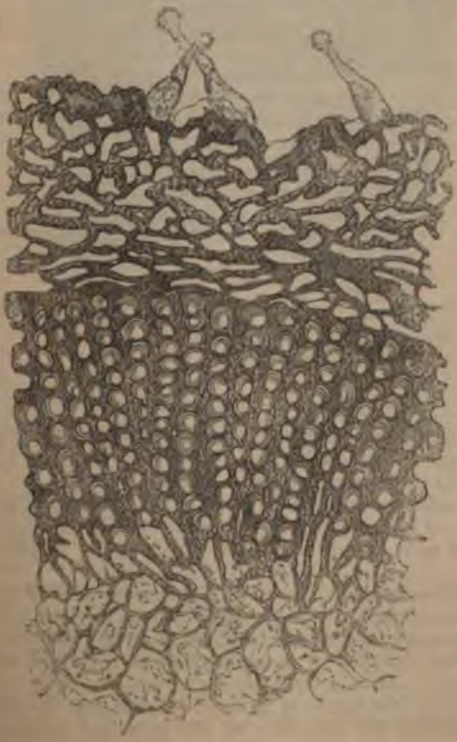


Fig. 148.

PORTION OF TRANSVERSE SECTION OF MID-RIB OF LEAF OF TOBACCO.

(Magnified 90 diameters.)



17th Sample.—Purchased of G. Mills, 33. South Molton-street.
Genuine, but contains a small quantity of *powdered cassia*.

18th Sample.—Purchased of W. J. Brown, 12. High-Street, Islington. In pa
age, labelled

"GENUINE INDIA CURRY-POWDER."

Contains RED-LEAD, a considerable quantity of *potato-flour*, and much sa

19th Sample.—Purchased of White & Fairchild, 63. Borough. In packa
labelled

"SCHAH SOOJAH INDIA CURRY-POWDER."

Contains a considerable quantity of *ground rice*, and a little *salt*.

20th Sample.—Purchased of Fortnum & Mason, Piccadilly.
Genuine.

21st Sample.—Purchased of S. Dummer & Co., 14. Marylebone-street.
Contains very much RED-LEAD.

22nd Sample.—Purchased of Robinson, Piccadilly. In package labelled

"CAPTAIN WHITE'S CURRY-POWDER,
(Originally called SELIM'S.)"

Genuine.

23rd Sample.—Purchased of Bardsley & Co., 103. Tottenham-court-road.
Contains a large quantity of *ground rice*.

24th Sample.—Purchased of Andrews & Co., 107. Tottenham-court-road.
Contains a considerable quantity of RED-LEAD.

25th Sample.—Purchased of Salmon & Co., 69. Tottenham-court-road.
Contains RED-LEAD and a very large quantity of *ground rice*.

26th Sample.—Purchased of W. Gilbert, 92. Tottenham-court-road.
Contains a considerable quantity of *ground rice*.

From a review of the above Table of Analyses, the following conclusio
may be deduced:—

Of the *twenty-six* samples of curry-powder submitted to microscopical an
chemical examination,

1st. That *seven* only were *genuine*.
2nd. That *nineteen*, or nearly four-fifths were *adulterated*.
3rd. That *ground rice*, usually in very large quantities, was present in a
samples.
4th. That *potato-farina* was detected in *one* sample.
5th. That *salt* was present in *eight* of the samples.
6th. That the highly poisonous metallic oxide, RED-LEAD, was detected
no less than *eight* of the samples.
7th. That in *seven* of the samples, the adulteration consisted of *ground rice* on
8th. That in *one* sample, the adulteration consisted of *ground rice* and *sal*
9th. That in *one* sample, the adulteration consisted of *ground-rice* and R
LEAD.
10th. That in *three* samples, the admixture consisted of *salt only*.
11th. That in *three* samples, the adulteration consisted of *salt* and RED-LEA
12th. That in *three* samples the adulteration consisted of RED-LED only.
13th. That in *one* sample, the adulteration consisted of RED-LEAD in co
nation with *potato-farina* and *salt*.

The above results do not give the whole of the adulterations to which
twenty-six samples have been subjected, since they do not include the FE
GINOUS EARTHS, which were shown, in our article on Cayenne, to be so freque
employed to impart colour to that substance. In consequence of the large
variable quantity of iron present in genuine curry-powder, it is not easy a
rately to determine in what cases that metal exists in excess. The ferrugi
earths consist of alumina, in combination with a small and variable amou
iron in the condition of red oxide.

We have thus shown that curry-powder is adulterated to nearly the s
extent, and frequently with ingredients equally pernicious, as the subject of
last [illegible] namely, cayenne.

teration of tobacco, and point out the differences between each of these and tobacco leaf.

e have now to consider the *composition* and *properties* of tobacco.

he principal analyses of tobacco which have hitherto been made are the wing :—

Vauquelin's Analysis.[*]

An acrid volatile principle (*nicotina*).
Albumen.
Red matter soluble in alcohol and water.
Acetic acid.
Supermalate of lime.
Chlorophylle.
Nitrate of potash and chloride of potassium.
Sal ammoniac.
Water.

Expressed Juice of Leaves.

he *leaves* contained, in addition to the above, woody fibre, oxalate and phose of lime, oxide of iron, and silica. The two latter substances were obtained the ashes. *Manufactured tobacco* contained the same principles, and in adn carbonate of ammonia and chloride of calcium, perhaps produced by the ren of sal ammonia and lime, which are added to tobacco to give it pungency.

Posselt and Reinmanns' Analysis.[†]

Nicotina - - - - - - -	0·06
Concrete volatile oil - - - - -	0·01
Bitter extractive - - - - - -	2·87
Gum with malate of lime - - - - -	1·74
Chlorophylle - - - - - -	0·267
Albumen and gluten - - - - -	1·308
Malic acid - - - - - -	0·51
Lignin and a trace of starch - - - -	4·969
Salts (sulphate, nitrate, and malate of potash, chloride of potassium, phosphate and malate of lime, and malate of ammonia) - - - - - -	0·734
Silica - - - - - - -	0·088
Water - - - - - - -	88·280
Fresh leaves of tobacco - - - -	100·836

Conwell's Analysis.[‡]

Gum.
Mucilage soluble in both water and alcohol.
Tannin.
Gallic acid.
Chlorophylle.
Green pulverulent matter, soluble in boiling water.
Yellow oil having the odour, taste, and poisonous properties of tobacco.
Pale yellow resin (large quantity).
Nicotina.
A substance analogous to morphia.
An orange-red colouring matter.
Nicotianin.

F the several constituents, the presence of which has been revealed by cheal analysis, the most important are nicotina or nicotine, and nicotianin, as n these the active properties of tobacco mainly depend.

ICOTINA exists not only in the leaves, both fresh and fermented, but in the ts, seeds, and even the smoke of tobacco. It is obtained by digesting an eous extract of the leaves in rectified spirit; this takes up the nicotina in agrees with digitalis, but it is not equal to foxglove in this respect. In its pow of causing relaxation of the muscular system it greatly surpasses digit From belladonna, stramonium, and hyoscyamus, it is distinguished by ca contraction of the pupil, both when applied to the eye, and when taken in nally in poisonous doses, and also by the absence of delirium and of any affe of the throat. From aconite it is distinguished by not possessing the pow paralysing the sentient nerves.

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[*] Ann. de Chim., vol. lxxi. p. 139.

[†] Gmelin's Handb. de Chem. vol. ii. p. 1303.

[‡] Silliman's Journal, vol. xvii., p. 369.

Tobacco is met with in two states—the "Raw" or "Unmanufactured," and the "Manufactured."

Tobacco in the raw state consists merely of the dried leaves; these, as im ported, are sometimes separate, and placed one upon the other, as in Tu tobacco; at others they are strung on strings, as in German tobacco; b usually they are imported in "heads" or "hands," as they are termed; different varieties of American tobacco come over in this state.

There are various kinds of dried leaf, or unmanufactured tobacco, dis guished by the name of the country in which it is grown, as well as by differen of colour and quality, arising chiefly from soil and climate.

United States Tobacco.—The principal supplies of tobacco to this coun are derived from the United States of America, the several kinds being nam after the states in which they are grown—as *Virginian*, *Kentucky*, *Maryla* *Missouri*, *Ohio*, and other descriptions, all cultivated in, and imported fr the United States.

Virginian Tobacco is the strongest kind of tobacco, and is not, therefore, well suited for cigars; it is best adapted for smoking in pipes and for snuff. Th colour of the leaves is deep brown, and they present a mottled appearance; they feel unctious, and are so tough that they may be bent double without breaking when not over-dried. Since this tobacco will retain more moisture than almo any other kind, and since its strength is much greater, it is extensively used by tobacco manufacturers.

Maryland Tobacco is paler in colour and weaker than the former; the "p *Cinnamon*" is the best, the "*Scrubs*" the commonest.

Kentucky Tobacco is described as being intermediate in strength between the it is paler than the Virginia.

Carolina Tobacco is less frequently met with, and is of inferior quality.

Columbian Tobacco is much esteemed for cigars, for which it is more us than any other kind. The leaves are marked with light yellow spots. Oth varieties of Columbian tobacco are, *Varinas*, brought over in rolls and heads, very mild tobacco, and *Cumana*.

Oronoko Tobacco comes over in separate leaves; it is of a yellow colour and is very mild and delicate.

Cuba Tobacco is also a mild tobacco, and the most esteemed for cigars; th grown near the town of *Havannah* is the finest; the leaves of this are yellowi brown, with a musky or spicy odour. The ordinary tobacco grown on th island is darker than the Havannah. Both kinds are imported in heads, and ar remarkable for the light yellow spots on the leaves.

St. Domingo Tobacco comes over in separate leaves, and is of inferior quality.

Brazilian Tobacco.—A very small quantity only of this tobacco is imported from the Brazils.

Dutch or Amersfoort Tobacco is very mild, and deficient in flavour; the darker kind is the strongest, and is much used for snuff; while the mildest is employed for the commonest cigars.

Levant Tobacco includes *Turkey*, *Latakia* (a Syrian tobacco), and *Salon* tobacco; these are all the produce of *Nicotiana rustica*; they are mild, bu valuable tobaccos. *Turkey* tobacco comes over in broad and separate leaves, of a bright-yellow colour.

Persian or *Shiraz Tobacco* is also a Levant tobacco; it is delicate and frag rant, and is the produce of *Nicotiana Persica*.

Another description is East India Tobacco, of which a small quantity only is imported; it is not much esteemed.

Manilla Tobacco, grown near the town of Manilla, in Lucon, one of the

Carbonaceous matter.
Moisture, and several gases.

ərdorben[*] obtained, by the dry distillation of tobacco, the following ts :—

A volatile oil.
An oleaginous acid.
An empyreumatic acid.
Resin.
Traces of a powder insoluble in potash and acids.
Odorin, a small quantity.
A base soluble in water (Nicotin ?).
Fuscin.
Red matter soluble in acids.
Two extractive matters, one forming a soluble, the
other an insoluble compound with lime.

e recently Zeise[†] has made a careful analysis of tobacco smoke, and gives owing as its constituents :—

A peculiar empyreumatic oil.
Butyric acid.
Carbonic acid.
Ammonia.
Paraffine.
Empyreumatic resin.
Water.
Acetic acid, probably.
Carbonic oxide.
Carburetted hydrogen.

ly, Melsens[‡] has detected nicotina in tobacco smoke. The empyreumatic obacco is undistinguishable from that of foxglove. It is evident, there-hat tobacco smoke contains the more active constituents of tobacco, and consequently possesses to some extent the properties of the leaf. We ereafter enter upon the question of the effects upon the system of the f smoking tobacco, but we now confine our remarks to the physiological and effects of tobacco when administered.

nall doses tobacco produces a sensation of heat in the throat, and some- feeling of warmth in the stomach ; it also frequently excites nausea, and iar sensation of giddiness, more allied to incipient intoxication ; by repe-t acts as a diuretic and laxative.

rger doses it occasions distressing nausea, accompanied with a sensation ing at the pit of the stomach, vomiting and purging ; occasionally it acts nodyne, or more rarely promotes sleep. But the most remarkable symp-roduced by it are langour, feebleness, relaxation of the muscles, trembling imbs, great anxiety, and tendency to faint ; the pulse is small and weak ; tion somewhat laborious ; surface cold and clammy, and, in extreme cases, re convulsive movements.

rge doses the effects are nearly the same, but more violent in degree ; vulsive movements are followed by paralysis and a kind of torpor ter-ng in death.

application of tobacco *to abraded surfaces* is a very dangerous practice. has been related which proved fatal in three hours and a half, in which ressed juice had been applied for the cure of ringworm to the head of a ght years of age.

cco has also frequently proved fatal in the form of *glyster*. Dr. Copland f a drachm in infusion prove fatal.

operation of tobacco resembles somewhat that of Lobelia inflata, both nodyne and antispasmodic. In its enfeebling action on the heart it

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[*] Poggendorff's Annalen, viii. 399.

[†] Annal. d. Chemie u. Pharm., vol. xlvii. p. 212, 1843.

[‡] Ann. de Chim. et de Physiq., 3me sér. t. ix. p. 465.

8th Sample.—Purchased of E. & J. Freeman, 3. Wigmore-street.
Contains *a small quantity of* COPPER. Ash *somewhat pink.* Solution of the ash, tested with ammonia, of a *faint blue.*

9th Sample.—Purchased of Crosse & Blackwell, 21. Soho-square.
Contains *a good deal of* COPPER. Ash of a *light* but *decided pink.* Solution of the ash, tested with ammonia, becoming of a *pale blue* colour; *a coating of copper* also being deposited on a rod of iron immersed in the acidulated solution.

10th Sample.—Purchased of Castell & Brown, 45. Princes-street, Leicester-square.
Does not contain copper. Ash of a *white* colour. The appearance of the gooseberries, in this case, differs remarkably from those of all the previous samples. The fruit is of a yellow colour, with scarcely a tinge of green. We have seen, in shop-windows at the West-end, gooseberries precisely resembling these in colour, and we believe, if inquiries were made, that in most cases it would turn out that the parties were supplied by Messrs Castell & Brown.

GREENGAGES.

11th Sample.—Purchased of G. Whybrow & Co., 4. Minories.
Contains *a very considerable quantity of* COPPER. An iron rod immersed in the fluid in which the fruit is preserved became covered with *a thick coating of copper.* Ash of a *decided and rather deep pink* colour. Solution of the ash, tested with ammonia, changed to a *decided blue.*

12th Sample.—Purchased of Crosse & Blackwell, 21. Soho-square.
Contains *a very considerable quantity of* COPPER. An iron rod immersed in the fluid in which the fruit is preserved became *thickly coated all over with copper.* Ash of a *decided and rather deep pink* colour; solution of the ash tested with ammonia changed to a *bright blue.*

13th Sample.—Purchased of E. Lazenby, 6. Edwards-street, Portman-square.
Contains *a very considerable quantity of* COPPER. An iron rod immersed in the fluid in which the fruit is preserved became *thickly coated with copper.* Ash of a *decided and rather deep pink colour*; solution of the ash tested with ammonia changed to a *bright blue.*

14th Sample.—Purchased of R. & C. Faulkner, 44. Jermyn-street.
Contains a *very considerable quantity of* COPPER. An iron rod immersed in the fluid in which the fruit is preserved became *thickly coated with the metal.* Ash of a *decided pink colour;* solution of the ash tested with ammonia changing to a *bright blue.*

It should be remarked, that in all the above cases, the greengages, as contained in the bottles, presented to the eye a suspicious and unnatural deep bluish-green colour, which was much heightened by boiling; in this state the fruit exhibited, in fact, the characteristic verdigris hue.

15th Sample.—Purchased of Hedges & Butler, 155. Regent-street.
Contains *a trace of copper only.* Ash *nearly white,* with a *shade of pink* here and there; solution of ash treated with ammonia became of *a very faint blue colour.*

16th Sample.—Purchased of Fortnum & Mason, 182. Piccadilly.
Contains *a small quantity of copper.* Ash *decidedly pink;* solution of ash treated with ammonia became *light blue.*

17th Sample.—Purchased of Castell & Brown, 45. Princes-street, Leicester-square.
Contains *a trace of copper.* Ash *slightly pink here and there.* Solution of ash treated with ammonia became *very faintly blue.* The greengages in this case were of large size, firm, and plump, the colour being well preserved and natural.

18th Sample.—Purchased of Howis & Masson, 216. Piccadilly.
Contains *a very small quantity of* COPPER. Ash *here and there slightly pink.* The greengages in this case were of large size, firm, and plump, the colour being well preserved without presenting an unnatural appearance.

pine Islands, is a dark-coloured tobacco, and is extensively used in the
acture of cheroots.

he hands of the manufacturer the leaf is converted into manufactured
o in the following manner:—

leaves are unfolded and "stripped"—that is, the mid-ribs or stalks are
d; this is done by a sudden jerk of the stalk by the hand, holding by the
They are then sprinkled with "sauce" or "liquor;" this, properly, should
of water only, but in some cases it contains salt, and is coloured with
or liquorice; but these additions are adulterations. After the sprinkling,
ch the leaves imbibe a good deal of the liquor, and therefore become in-
d in weight, they are put into large, flat, square, iron boxes, and pressed
solid cake; during the pressure, if too much "liquor" has been used for
rinkling of the leaves, some escapes, deeply coloured with extractive
d from the tobacco-leaf. This, mixed with the washings of the cloths used
sing, is sold as "tobacco water," and is used as a sheep-wash, and also
deners to destroy worms and other vermin. The cake is then cut into
with knife-edged chopping-stamps, the shreds varying in diameter of
ixteen to one hundred to the inch. Lastly, the tobacco in this state is
dried or "stoved" in a flat copper or iron tray, heated by sand, and
ntly by steam.

above process of course applies only to CUT OR SHAG TOBACCO; in the
acture of "ROLL TOBACCO" a totally different method is followed:—

leaves, or rather the half-leaves, are arranged end to end in a line down
table; this is mostly done by women or boys. One of the leaves, having
en twisted into a kind of thin rope, is attached to an iron hook, which is
to revolve rapidly, by means of a wheel, in a horizontal position on a level
he surface of the table. The "spinner" then, with a small board fixed to
lm of the hand, while the rope is turning, attaches leaf after leaf, rolling
ardening it with the board as the length proceeds. When sufficient is
factured, the rope is coiled up so as to form a barrel-shaped pile or mass,
ayer being well oiled with a brush, to prevent the coils from adhering to
other. The coils being firmly pegged together with wooden nails, the
pile is then steeped in "liquor," and finally pressed, oiled, and polished
brush. It is estimated that this kind of tobacco increases in weight in the
acture from fifteen to twenty-five per cent.

manufactured tobaccos may be referred to one or other of the four follow-
rms or kinds:—

he first kind the leaves are cut into shreds; to this all the different varieties
tobacco belong.

he second, the leaves are twisted or spun into a kind of rope; this includes
fferent kinds of *roll*, *spun*, or *twist tobacco*.

the third, the stripped leaves are folded one over the other, so as to form
and *cheroots*.

the fourth form, the leaves are reduced to powder, constituting *snuff*.

need only describe at present the different varieties of cut and roll to-
:—

chief kinds of cut tobacco are *Shag*, *Returns*, and *Bird's-eye*; other less
on kinds are *Maryland*, *K'Naster*, *Oronoko*, *Turkey*, *Persian*, and
as.

g is prepared chiefly from Virginia and Kentucky tobacco.

urns is a light-coloured, mild tobacco. The true derivation of its name is
be, that formerly the tobacco known as "*short cut*" was with much
rubbed through a wire sieve; the finer portions and dust, technically
"smalls," passed through, and were supposed to be much the strongest;
no more would go through, that which was left upon the sieve was reckoned
milder, and of superior quality, and called in the trade "Returns." Ac-
g to Pereira its name is derived from its being formerly prepared by
ing Shag for re-cutting. In the Report on the Tobacco Trade, by the
Committee of the House of Commons, made in August 1844, it is
bed as "made up of the small pieces of broken leaves, and the dust and
produced in the various processes of manufacture."

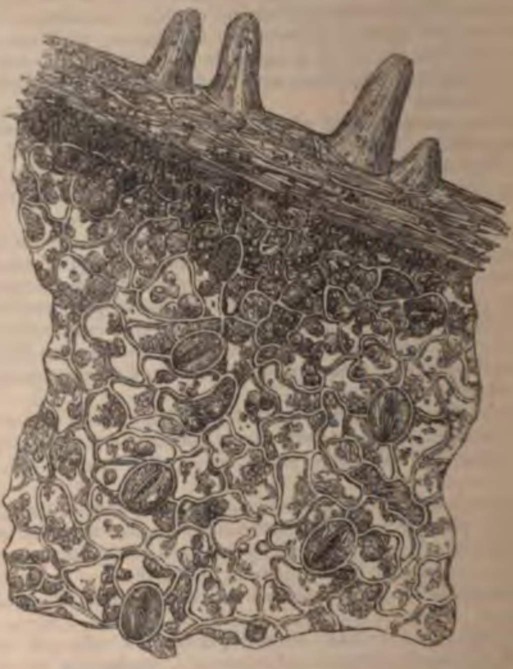
if it contain any of those enumerated on the preceding page, in ever so fin of powder, and even in the smallest quantities, they may be detected w greatest certainty with the aid of the microscope, since they all presen liarities of structure by which they may be readily distinguished.

Thus the structure of the leaves of the Common Dock is very charact it is as follows: — The cells of the lamina do not differ materially in shape from those of the tobacco-leaf, neither do the stomata present an peculiarity; like those of tobacco, they occur on both surfaces of the but of course are most numerous on the under surface; unlike t however, the cellular part of the lamina is wholly destitute of hairs. Fig

Fig. 150.

PORTION OF UNDER SURFACE OF THE LEAF OF THE DOCK,

Showing the cells and stomata, as also the junction of the cellular part of the leaf with one of the smaller veins. Magnified 220 diameters.



The structure of the mid-rib and veins is very different from tobacco; they differ in shape, in the form and nature of the spines which arise from them, and in the arrangement of the vessels and woo Transverse sections of the mid-rib are of a somewhat triangular form, of the triangle being smaller than the sides; one of these, viewed with object-glass, presents six prominences, indicating the number of ri which the mid-rib, in a longitudinal view, is seen to be traversed: ridges, one is situated on the upper surface of the mid-rib, (the ba triangle,) between the origins of the lamina of the leaf; the other below, one in the centre large and prominent, forming the lower surfa mid-rib, (apex of the triangle,) and two on either side.

The hairs, or rather spines, spring from the surface of the veins, and principally from the ridges; they are thick, short of considerable diameter, and terminate in obtuse rounded nd for the purposes of his business as a grocer, and shall not be premises used for the manufacture of tobacco or snuff."

e 7. it is made "lawful for any officer of Excise, at any time he shall ke a sample or samples of any tobacco or snuff manufactured, or in of manufacture, or manufactures in the stock or possession of any er of, dealer in, or retailer of, tobacco, paying for the same, if at the current wholesale price of such tobacco or snuff."

enacts "that every person who shall cut, grind, pound, colour, or manufacture any leaves, or any herb or plant, moss or weed, or hicory, commings or roots of malt, or any other vegetable matter, tate or resemble tobacco or snuff, or who shall have in his possession above-mentioned substances, or any syrup, liquid, or preparation to he manufacture of tobacco or snuff, shall forfeit two hundred pounds; h leaves, herbs, plants, &c. &c., together with all machines, tools, vessels, and utensils for cutting, grinding, pounding, colouring, eing, manufacturing, or preparing the same, shall be forfeited."

13. it is enacted that no person shall hawk about tobacco or snuff der a penalty; and any officer of excise or customs may arrest the d convey him before a justice of the peace, who has the power to penalty of one hundred pounds, in default of payment of which the y be committed to prison, and there kept to hard labour for a period endar months.

n, is the present state of the law with regard to the adulteration of very addition made to cut tobacco in the course of manufacture, ater, or water and oil in the making of roll tobacco, is an adulter- ecting the manufacturer to the heavy penalty of three hundred

number of substances enumerated in the Act, it would appear that different articles have been employed in the adulteration of tobacco; is reason for believing that tobacco has been extensively adul- deed, convincing proof of this is afforded by the evidence given on trade before the parliamentary committee already referred to, as well xamination of the Excise returns at different periods, showing the prosecutions instituted, and fines inflicted on parties who have been y of adulterating tobacco.

wing are the substances which have either been discovered, or have on good authority to have been employed, in the adulteration of her in the form of cut or roll tobacco, cigars, or snuff; they may be

o *vegetable substances not tobacco*, as the leaves of the dock, rhubarb, abbage, potato, &c.; malt cummings — that is, the roots of germi- t; peat, which consists chiefly of decayed moss; seaweed, roasted t, bran, catechu or terra japonica, and oakum.

, into *saccharine substances*, as cane-sugar, treacle, honey, liquorice, regs.

into *salts and earths*, as nitre, common salt, sal ammoniac, or te of ammonia, nitrate of ammonia, carbonate of ammonia, the potash and soda, and lime-water; yellow ochre, umber, fuller's tian red, sand, chromate of lead.

ction of some of the above substances is easy enough, but others at difficulties. The complete examination of a sample of tobacco, w to determine whether it is adulterated or not, involves a very e expenditure of time and trouble, as will appear from the fol- ils.

od of examination to be pursued is as follows: —

quantity of each tobacco (100 grains) is to be weighed immediately urchased, and before it has had time to lose weight by evaporation, ghly dried at a temperature of about 100° Fahr. It is then to be the loss or per-centage of water is by this means ascertained.

ple may next be thoroughly examined by means of the microscope, ascertain whether there be any foreign vegetable substance present;

TABLE SHOWING THE RESULTS OF THE CHEMICAL AN
FRUI

	Name.	Fruit or Vegetables.	Colour previous to Cooking.	Colour when
1	T. Snelling.	Red currants.	Natural.	Natur
2	E. Fenning.	Raspberries and Currants.	Natural.	Natur
3	Crosse and Blackwell.	Ditto ditto.	Natural.	Natur
4	Crosse and Blackwell.	Cherries.	Natural.	Natur
5	G. Whybrow and Co.	Gooseberries.	Unnaturally green.	Deep bluis
6	T. Snelling.	Ditto.	Grassy green.	Coppery
7	E. Fenning.	Ditto.	Unnaturally green.	Coppery
8	E. and J. Freeman.	Ditto.	Dull, unnatural green.	Bluish
9	Crosse and Blackwell.	Ditto.	Grassy green.	Coppery
10	Castell and Brown.	Ditto.	Natural.	Natur
11	G. Whybrow.	Greengages.	Very unnaturally green.	Deep coppe
12	Crosse and Blackwell.	Ditto	Unnaturally green.	Deep coppe
13	E. Lazenby.	Ditto.	Unnaturally green.	Deep coppe
14	R. and C. Faulkner.	Ditto.	Very unnaturally green.	Deep coppe
15	Hedges and Butler.	Ditto.	Natural.	Natu
16	Fortnum and Mason.	Ditto.	Rather too green.	Rather to
17	Castell and Brown.	Ditto.	Natural.	Natu
18	Howis and Masson.	Ditto.	Natural.	Natu
19	J. Willmott and Co.	French Olives.	Unnaturally green.	. .
20	Burgess and Son.	Ditto.	Unnaturally green.	. .
21	C. Wix and Sons.	Ditto.	Unnaturally green.	. .
22	Harrington and Lucas.	Ditto.	Olive yellowish green.	. .
23	Sams and Co.	Ditto.	Unnaturally green.	. .
24	Neighbour and Sons.	Ditto.	Natural.	. .
25	Hedges and Butler.	Spanish Olives.	Natural.	. .
26	A. S. Levy.	Limes.	Intense olive-green.	. .
27	Fortnum and Mason.	Ditto.	Deep green.	. .
28	Batty and Feist.	Rhubarb.	Very unnaturally green.	Deep copp
29	Westbrooke and Co.	Ditto.	Unnaturally green.	Very deep co
30	Russell and Co.	Ditto.	Unnaturally green.	Coppery
31	Castell and Brown.	Ditto.	Natural.	Yellowis
32	J. Willmott and Co.	Rhubarb & Gooseberries.	Unnaturally green.	Coppery
33	J. Wingrave.	Ditto ditto.	Unnaturally green.	Coppery
34	Joseph Colin.	Peas.	Very yellow.	Very y

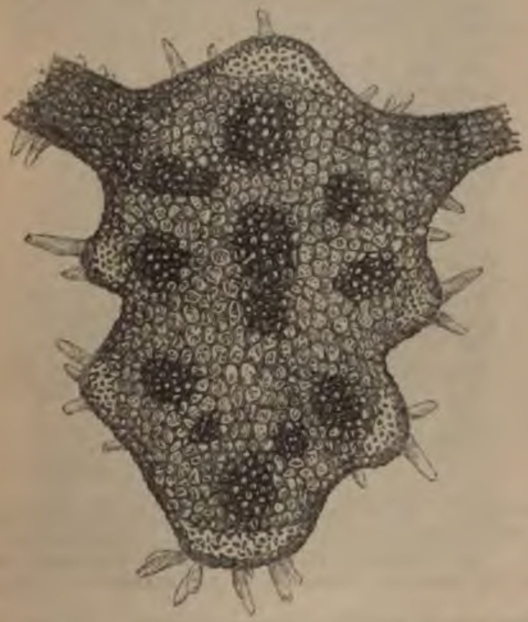
ese spines which impart a feeling of roughness to the finger passed along the id-rib.

The woody fibre and vessels traverse the mid-rib in bundles; the number of undles being greatest in sections of the larger mid-ribs; in those of small and edium size there are usually six or eight fasciculi. *Fig.* 151.

Fig. 151.

TRANSVERSE SECTION OF MID-RIB OF LEAF OF DOCK.

(Magnified 40 diameters.)



The cells forming the ridges are very characteristic, being small and angular; those composing the internal part of the mid-rib, and which are traversed by the vascular and woody tissue, are larger and more reticular.

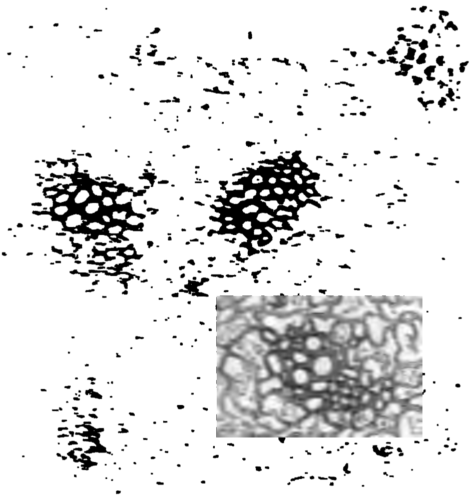
The above structural peculiarities are clearly shown in *figs.* 152. and 153.

Descriptions and figures illustrating the structure of the other leaves and principal vegetable substances which have been detected in adulterated tobacco, will be given hereafter.

The microscopic examination of the tobacco being completed, 100 grains should be thoroughly dried, and then gently shaken; should it contain any sand or earthy substance, this, which adhered to the tobacco while moist, will now readily fall from it. Having determined these points, the examination must be continued as follows:—

One hundred grains of the tobacco dried previously are to be carefully incinerated, and the ash weighed; the soluble salts are to be separated from those that are insoluble by means of distilled water, and the weight of these determined. If the total ash be at all in excess over that which is common to genuine tobacco, adulteration may be suspected; and the nature of the analysis to be next pursued will depend upon whether the excess be in the insoluble or soluble portion of the ash: if in the former we must look for excess of lime, and perhaps also of alumina; if in the latter, we must search either for nitrate of potash, which by incineration becomes converted into carbonate of potash, or for chloride of sodium.

[illegible]



Th[illegible] which tobacco might be adulterated [illegible] [illegible] sal ammoniac, that is hydrochlorate of amm[illegible] [illegible] presence of this salt may be determined by sublimat[illegible] [illegible] of ammoniacal gas evolved on boiling wit[illegible] [illegible]

For another [illegible] portion of tobacco, an extract must be obtained [illegible] [illegible] grains of the dried tobacco, about four ounces o[illegible] [illegible] this should be raised to a temperature of nearly [illegible] [illegible] for about forty minutes. The infusion is [illegible] [illegible] set aside to macerate for twelve hours. L[illegible] [illegible] evaporated at a temperature of about 100°, the extrac[illegible] [illegible] weight, and then divided.

The extract may be divided into two equal parts: of one, a quanti[illegible] [illegible] by Fehling's process, is to be made for glucose or grape sugar, [illegible] is the sweet principle of treacle, [illegible] liquorice, and honey; the [illegible] portion is to be incinerated, the weight of the ash determined, and, if in ex[illegible] analysed.

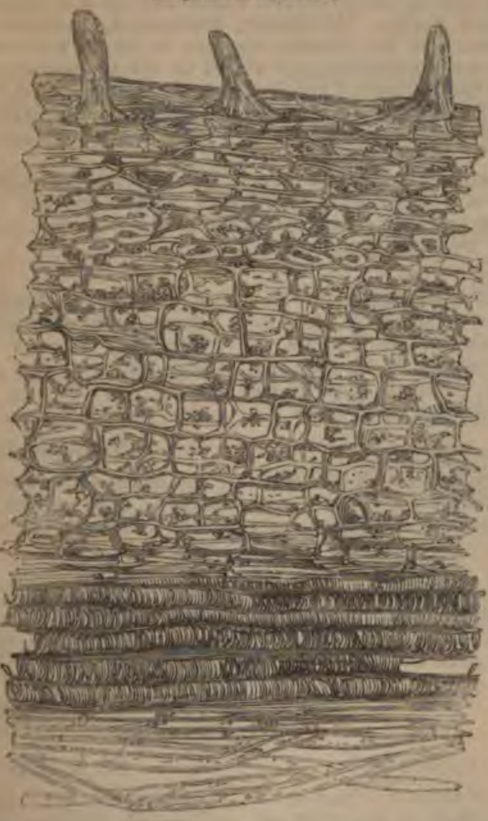
If it be suspected that cane-sugar is present, instead of adopting Feh[illegible] process we must employ the fermentation test, and estimate either the qua[illegible] of carbonic acid gas evolved, or the amount of alcohol generated. Exce[illegible] that the results obtained by the copper test are more accurate than the [illegible]mentation test, it would save time to employ the latter in all cases fo[illegible] determination of the presence of saccharine matter, whether in the for[illegible] glucose or cane-sugar.

The test liquor used may be prepared as follows:—Dissolve 69 grains of crystallised sulphate of copper in 276 grains of distilled water; to this ad[illegible] grains of a saturated solution of tartrate of potash, then add 80 grai[illegible] hydrate of soda, previously dissolved in one ounce of distilled water, shak[illegible] well together, and introduce the liquor into a vessel capable of holding

Fig. 153.

LONGITUDINAL SECTION OF MID-RIB OF LEAF OF DOCK.

(Magnified 90 diameters.)



, graduated into 1000 equal parts, and fill up with distilled water. Every ains, or 100 parts, of this test liquor are sufficient to decompose one grain cose. It is better, however, to add excess of the solution, and to weigh d oxide thrown down.

fermentation test is used in the following manner: — 1000 grains of o are to be placed in a vessel, and a pint or so of water, at a temperature ut 100° Fahr., poured upon it; the infusion is then to be strained, and 250 of dried yeast added; the mixture is next to be set aside for forty-eight to ferment, at a temperature of about 60°; lastly, the liquor must be in- ed into a retort, the alcohol distilled over, and its amount estimated, or the ic acid may be collected, and the amount of sugar calculated therefrom.

ill be evident from the above particulars, that a complete analysis of o, with the view to determine whether it be adulterated or not, is a task of inary difficulty; so difficult indeed is it that some chemists have enter- the opinion that it is possible to adulterate tobacco in such a manner as detection by any means; and this is no doubt the case.

learn from the Report by the Select Committee of the House of Commons tobacco trade, more than once referred to, that so convinced were the cturers of London of the inability of the Excise officers to detect adul- ns in tobacco, that they "proposed to the secretary to the Excise Board d specimens of pure and of adulterated tobacco, that the Excise officers

There is little question, therefore, but that, in the majority of cases, the fol ing analyses represent the actual qualities and condition of the vinegars of several manufacturers by whom London is suppled. The samples were not p cured direct from the makers, because of the difficulty experienced in obtai them by parties not engaged in the trade.

The same ingenious system as that pointed out above, prevails in the ar mustard. The manufacturer of this prepares three different qualitie double superfine, superfine, and fine—which may be thus characterised: m flour and turmeric, and a little mustard; still more flour and turmeric, and l mustard; nearly all flour and turmeric, with scarcely any mustard.

In our first Report on Vinegar, the quantity of sulphate of baryta thr down, on the addition of chloride of barium, was determined in the follow manner:—

The precipitate was collected on a filter, both being afterwards burned i platinum crucible, to get rid of the organic matter, and the residue weigh the previously ascertained weight of the ash left by the filter being deducted

In the present case, the precipitates were obtained by decantation; a being once or twice washed with distilled water, they were dried in a glass c sule, and their weight taken. This method is both more simple and perh more accurate, the only objection to it being, that, in some instances, t precipitate requires many hours fully to subside, in consequence of a port being held in suspension by the organic matter contained in the vinegar.

RESULTS OF THE CHEMICAL EXAMINATION OF TWENTY-EIGHT SAMPLES PU PORTING TO BE FROM THE VINEGARS OF THE DIFFERENT MAKERS AND ME CHANTS BY WHOM LONDON AND ITS SUBURBS ARE SUPPLIED, AND AS P CURED FROM VARIOUS GROCERS, PUBLICANS, AND OILMEN.

1st Sample.—Purchased of J. Owtram, 6. Connaught-terrace, Edgware-ro Sold as the vinegar of

R. BURNETT & CO.,
VINEGAR MAKERS,
VAUXHALL.

Contains a *considerable quantity of sulphuric acid.* 1000 grains by meas of this vinegar yield 54·46 grains of *acetic acid*, or 5·44 *per cent.*, and of *monohydrated sulphuric acid.*

2nd Sample.—Purchased of J. C. Holden, 48. Cambridge-street, Hyde-p square. Sold as the vinegar of

R. BURNETT & CO.
VINEGAR MAKERS,
VAUXHALL.

Contains a *considerable quantity of sulphuric acid.* 1000 grains yield 5 grains of *acetic acid*, or 5·05 *per cent.*, and 1·54 of *sulphuric acid.*

3rd Sample.—Purchased of W. Fontaine, 10. Vere-street, Clare-market. as the vinegar of

R. BURNETT & CO.,
VINEGAR MAKERS,
VAUXHALL.

Contains a *considerable quantity of sulphuric acid.* 1000 grains yield grains of *acetic acid*, or 5·18 *per cent.*, and 1·60 of *sulphuric acid.*

4th Sample.—Purchased of E. Chappell, 1. Ranelagh-terrace, Pimlico. as the vinegar of

MESSRS. BEAUFOY & CO.,
VINEGAR MAKERS,
NINE ELMS.

Contains an *immense quantity of sulphuric acid.* 1000 grains yield grains of *acetic acid*, or 3·51 *per cent.* and 4·00 of *sulphuric acid.*

h Sample.—Purchased of J. Christmas, 34. South Audley-street. Sold as the vinegar of

MESSRS. BEAUFOY & CO.
VINEGAR MAKERS,
NINE ELMS.

Contains an *immense quantity of sulphuric acid.* 1000 grains yield 40·12 grains of *acetic acid*, or 4·01 *per cent.*, and 4·02 of *sulphuric acid.*

h Sample.—Purchased of R. & C. Faulkner, 44. Jermyn-street. Sold as the vinegar of

MESSRS. POTTS & CO.,
VINEGAR MAKERS,
BRIDGE-STREET, SOUTHWARK.

Contains a *very small quantity of sulphuric acid.* 1000 grains yield 48·33 grains of *acetic acid*, or 4·83 *per cent.*, and ·63 of *sulphuric acid.*

h Sample.—Purchased of T. Wood, Bridge-terrace, Harrow-road. Sold as the vinegar of

MESSRS. POTTS & CO.,
VINEGAR MAKERS,
BRIDGE-STREET, SOUTHWARK.

Contains a *very small quantity of sulphuric acid.* 1000 grains yield 48·33 grains of *acetic acid*, or 4·83 *per cent.*, and ·63 of *sulphuric acid.*

h Sample.—Purchased of E. Price, 45. Coleshill-street, Pimlico. Sold as the vinegar of

MESSRS. GRIMBLE, PODMORE, & CO.,
VINEGAR MAKERS,
No. 1. NORTH-PLACE, ALBANY-STREET.

Contains *a very considerable quantity of sulphuric acid.* 1000 grains yield 41·99 grains of *acetic acid*, or 4·19 *per cent.*, and 1·86 of *sulphuric acid.*

h Sample.—Purchased of S. Hardstaffe, 114. Edgware-road. Sold as the vinegar of

MESSRS. GRIMBLE, PODMORE, & CO.,
VINEGAR MAKERS,
No. 1. NORTH-PLACE, ALBANY-STREET.

Contains *an immense quantity of sulphuric acid.* 1000 grains yield 27·63 grains of *acetic acid*, or 2·76 *per cent.*, and 4·13 of *sulphuric acid.*

th Sample.—Purchased of G. Mills, 124. Edgware-road. Sold as the vinegar of

CHAMPION & CO.,
VINEGAR MAKERS,
OLD-STREET-ROAD.

Contains *a very considerable quantity of sulphuric acid.* 1000 grains yield 39·40 grains of *acetic acid*, or 3·94 *per cent.*, and 2·04 of *sulphuric acid.*

th Sample.—Purchased of W. Hudson, 16. Crawford-street, Bryanston-square. Sold as the vinegar of

CHAMPION & CO.,
VINEGAR MAKERS,
OLD-STREET-ROAD.

Contains *a very considerable quantity of sulphuric acid.* 1000 grains yield 43·29 grains of *acetic acid*, or 4·32 *per cent.*, and 2·00 of *sulphuric acid.*

2th Sample.—Purchased of F. Tuck, 138. St. Alban's-place, Edgware-road. Sold as the vinegar of

MESSRS. HILLS & UNDERWOOD,
VINEGAR MAKERS,
NORWICH.

Does not contain free sulphuric acid. 1000 grains yield 56·38 grains of *acetic acid*, or 5·63 *per cent.*, and ·44 of *combined sulphuric acid.*

3th Sample.—Purchased of J. Hopkinson, 132. High Holborn. Sold as the vinegar of

MESSRS. HILLS & UNDERWOOD,
Vinegar Makers,
Norwich.

Does not contain free sulphuric acid. 1000 grains yield 56·66 grains of *acid*, or 5·66 *per cent.*, and 0·38 of *combined sulphuric acid.*

14*th Sample.*—Purchased of J. Leigh, 122. Whitechapel-road. Sold vinegar of

MESSRS. HILL, EVANS, & CO.,
Vinegar Makers,
Worcester.

Does not contain free sulphuric acid. 1000 grains yield 51·84 grains of *acid*, or 5·18 *per cent.*, and *combined sulphuric acid*, as stated below,

15*th Sample.*—Purchased of J. Swinge, 3. Arbour-terrace, Commerci East. Sold as the vinegar of

MESSRS. HILL, EVANS, & CO.,
Vinegar Makers,
Worcester.

Does not contain free sulphuric acid. 1000 grains yield 33·57 grains o *acid*, or 3·35 *per cent.*, and *combined sulphuric acid*, as stated belo

16*th Sample.*—Purchased of C. Batty, Grand Junction-terrace, Edgwar Sold as the vinegar of

MESSRS. HILL, EVANS, & CO.,
Vinegar Makers,
Worcester.

Does not contain free sulphuric acid. 1000 grains yield 49·24 grains o *acid*, or 4·92 *per cent.*, and *combined sulphuric acid*, as stated belo

The vinegars of Messrs Hill, Evans, & Co. have been recently anal Professors Graham, Hofmann, and Playfair. The quantity of *combined* su acid given in their analyses ranged from 1·23 to 1·33: this is derived fr grain and well-water used, but principally from the latter, which contains siderable quantity of sulphate of lime, in which respect it is like the water, only that the quantity of lime is greater.

17*th Sample.*—Purchased of Messrs. Smith and Tyers, Vinegar Mercha High-street, Borough. Sold as the vinegar of

Mr. J. P. OSBORNE,
Vinegar Maker,
Colchester.

Contains *a very considerable quantity of sulphuric acid.* 1000 grai 44·77 grains of *acetic acid*, or 4·47 *per cent.*, and 2·41 of *sulphuric*

18*th Sample.*—Purchased of W. Fontaine, 10. Vere-street, Clare- Sold as

COUNTRY VINEGAR.

Contains *an immense quantity of sulphuric acid.* 1000 grains yie grains of *acetic acid*, 3·51 *per cent.*, and 3·65 of *sulphuric acid.*

From inquiries made, we believe that this vinegar, as also that of succeeding samples, were made by Mr. Osborne, of Colchester.

19*th Sample.*—Purchased of W. Fontaine, 55. High-street, Whit Sold as

COUNTRY VINEGAR.

Contains *a very considerable quantity of sulphuric acid.* 1000 grai 52·33 grains of *acetic acid*, or 5·23 *per cent.*, and 2·60 of *sulphuric*

Tobacco, dried at 212°.	Per Cent. of Extract, &c., soluble in Water.	Per Cent. of Woody Fibre, &c., insoluble in Water.	Per Cent. of Ash after treating with Carbonate of Ammonia.	Per Cent. of Matter soluble in Water in the Ash.	Per Cent. of Matter soluble in Hydrochloric Acid in the Ash.	Per Cent. of Insoluble Matter, as Silica, &c., in the Ash.	Per Cent. of Alcohol obtained from fermented Infusion.	Per Cent. of Saccharine Matter deduced from the obtained Alcohol.
1. Light Missouri, leaf and stalk	49·	54·9	20·97 white	2·17	11·73	5·9		
2. Light Missouri, leaf only	50·	47·7	19·7 white	1·77	12·83	5·1	0·75	1·50
3. Dark Missouri, leaf and stalk	50·	52·4	16·47 white	4·2	10·14	2·13		
4. Dark Missouri, leaf only	51·	50·6	13·8 white	2·17	8·73	2·9	0·35	0·71
5. Light Virginia, leaf and stalk	51·5	53·1	16·4 gray-white	2·53	8·54	5·33		
6. Light Virginia, leaf only	54·	46·1	11·97 green-gray	2·0	6·86	3·11	1·045	2·09
7. Dark Virginia, leaf and stalk	48·5	51·8	14·7 gray	4·8	8·40	1·5		
8. Dark Virginia, leaf only	52·	49·8	12·53 gray	2·63	8·20	1·7	1·46	2·93

1. The samples were dried, and the extract and woody fibre were also dried at 212°. The watery infusions of all contained ammoniacal salts. The salts from the ash, which were soluble in water, consisted of sulphates, carbonates, phosphates, and chlorides, the bases being potassa and lime. The solution by hydrochloric acid contained lime, alumina, phosphate of lime, and oxide of iron.
3. Contained oxide of manganese in small quantity. Sulphates in watery solution of ash abundant. Hydrochloric solution contained an abundance of lime.
4. A trace of manganese; a trace only of phosphoric acid in watery solution.
5. Contained abundance of oxide of manganese.
6. Abundance of oxide of manganese.
7. A mere trace of oxide of manganese, and a trace of oxide of iron; only a trace of alumina.
8. A trace of oxide of manganese; quantity of oxide of iron very great; only a trace of alumina.

Without a full and an accurate knowledge of the structure and chemical composition of the several varieties of tobacco in its different states, unmanufactured and manufactured, it is impossible to attempt, with anything like a chance of success, to enter upon the detection of adulteration in tobacco. It is on this account that we have described so fully the organisation of the tobacco-leaf, and have given the various analyses of tobacco which have as yet been made.

The analyses of tobacco hitherto published are all of them, however, more or less defective, and we have therefore instituted some original analyses of the more important kinds of tobacco. These will be found to be of much value in the determination of the question of the adulteration of tobacco.

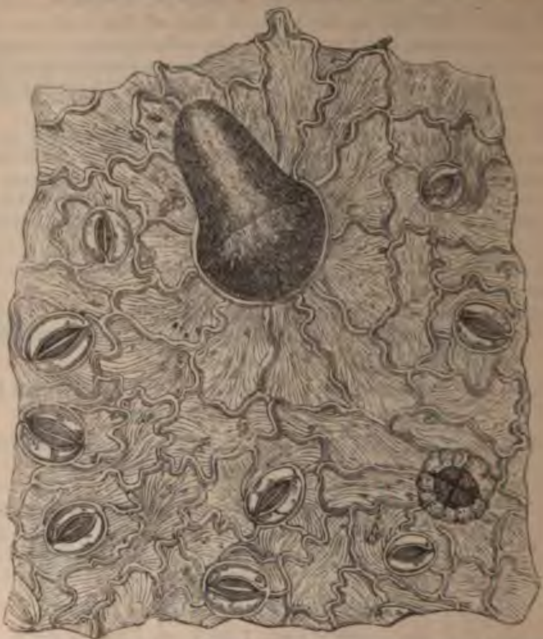
One hundred grains of each of the tobaccos were treated as follows:—They were dried for twenty-four hours in a water-bath, and then re-weighed; the loss showed the amount of hygrometric moisture which the samples contained.

They were then macerated for twenty-four hours in cold, distilled water, by which means the extractive was obtained. They were next boiled for an hour, by which they lost starch. The residue was ligneous matter, which yielded from three to ten per cent. of ash, composed chiefly of silica, with earthy carbonates and phosphates. The Table marked A represents the results obtained by the above processes.

One hundred grains of each tobacco were next submitted (according to the process of M. Schloesing) to the action of ammoniated ether. The ether was distilled off, and the residue neutralised with dilute sulphuric acid of known saturating power; by this means the proportions of nicotine, chlorophyle, and fat were determined. The Table marked B represents the results obtained by this process.

Fig. 154.

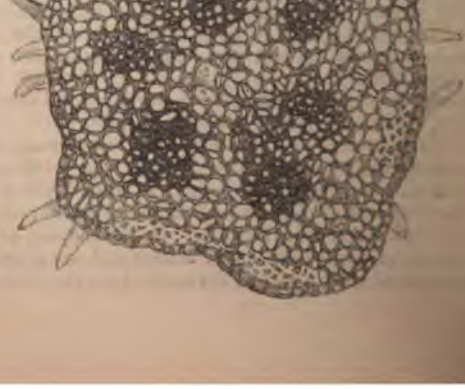
PORTION OF UNDER SURFACE OF RHUBARB LEAF,
Showing the situation of the cells, one of the short spines or hairs, and also one of the gland-like bodies. Magnified 220 diameters.



leaves of the two plants being in form, and in the absence of distinct rid
the mid-rib of the rhubarb leaf. *Fig.* 155.

Fig. 155.

TRANSVERSE SECTION OF MID-RIB OF RHUBARB LEAF.
(Magnified 40 diameters.)



xtend — first to all the organic products and compounds, as the gum,
arch, chlorophyle, fat, the organic acids, nicotine, and colouring
and secondly, to all the inorganic substances and salts, including a
soluble and insoluble carbonates, sulphates, chlorides, and phosphates.
e now in a position to form some idea of the extreme difficulty in
ng, in many cases, the question of the adulteration of tobacco. It is
evident that it is quite possible to adulterate tobacco to a large extent
cular manner, and with certain substances, without the possibility of
by any means at present known to science.

be observed that the ash furnished by the tobacco-leaf is very great,
g frequently to considerably over twenty per cent. This character has
supposition that it is possible to detect the adulteration of tobacco
es other than those of the tobacco plant, by means of the quantity of
hed on incineration. It is obvious, however, that no certain reliance
ced upon this test, since the tobacco-ash itself varies very greatly in
s is shown even by the above analyses, in which there is a variation of
2·6 per cent.

lowing elaborate table has even been constructed, in the hope that it
nish some useful data in determining adulteration of tobacco: —

e showing the Composition of the Ashes of various Plants likely to be employed in Adulterating Tobacco.

ANT.	Ash per cent.	Per cent. Composition of Ash.								
		Alkalies.	Lime.	Magnesia.	Alum.	Oxide of Iron.	Silica.	Sulphuric Acid.	Phosphoric Acid.	Chlorine.
es -	8 to 9	21·7	53·6	6·3	0·6	2·0	3·2	1·1	8·5	2·8
-	5 — 6	38·9	29·3	6·8	0·8	0·9	12·6	0·5	2·6	5·6
-	5 — 6	14·1	63·1	3·9	0·7	0·2	13·1	0·6	3·0	0·3
-	6 — 7	28·3	50·3	6·4	0·2	0·1	2·5	5·7	6·6	3·9
-	11 — 12	14·6	25·1	3·6	—	0·2	47·3	1·5	5·9	1·8
-	11 — 12	13·1	38·9	5·2	0·1	0·3	18·8	6·0	3·3	2·5
-	7 — 8	37·2	34·5	4·2	0·7	0·5	13·5	1·3	1·4	6·4
-	9 — 10	10·2	60·2	5·5	—	0·3	11·5	3·7	6·2	1·7
-	6 — 7	21·5	47·2	7·4	1·1	3·6	9·7	3·2	4·1	1·5
-	8 — 9	27·4	46·9	3·1	0·3	0·2	1·9	12·6	4·0	3·9
-	12 — 13	30·8	34·3	3·2	0·1	0·9	7·1	7·1	5·4	4·8
-	2 — 3	42·0	23·1	1·3	1·9	0·7	16·5	6·2	3·5	3·6
-	15 — 16	56·3	15·0	5·4	0·8	0·3	2·7	6·3	4·5	6·8
-	11 — 27	13·0	26·7	7·8	—	—	6·8	5·4	2·0	1·0"

ly safe and certain means for the determination of the adulteration of
ith foreign leaves is by the microscope, by the aid of which any one of
-enumerated leaves, if present, may be at once readily discovered.

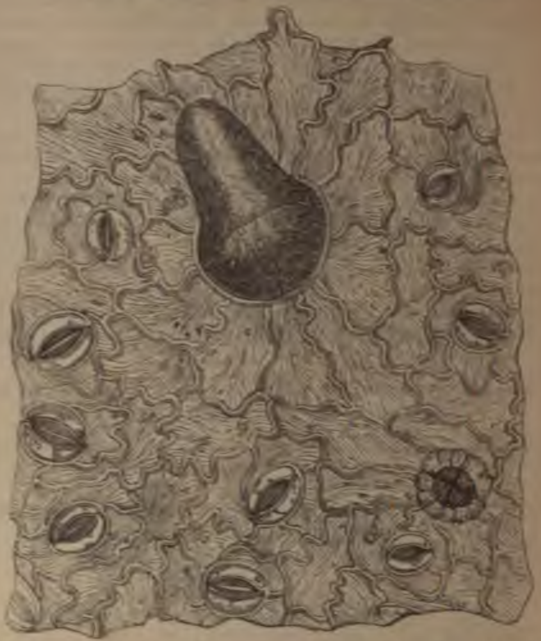
e already seen how very distinct the structure of the dock leaf is
of tobacco; we will now show that the organisation of the rhubarb
ally distinctive and characteristic.

tomata, and in the form and size of the cells of the rhubarb leaf,
erences only are observable; but the walls of the cells are finely
s shown in the wood-engraving; and this is a character by which
af may be at once known from tobacco. Other differences are found
racters of the short spines or hairs which clothe the leaf, in the form
d-rib and veins, and in the presence of gland-like bodies scattered
t the lamina of the leaf.

rs or spines are short, thick, hollow, striated, and terminate in obtuse,
xtremities. They resemble closely in form those of the dock, but
ing several times larger; in the character and fineness of the striæ with
y are marked, and by their distribution; for while in the dock the
ing only from the mid-rid and veins, in the rhubarb leaf they arise
arts of the leaf, the lamina as well as the mid-rib and veins.

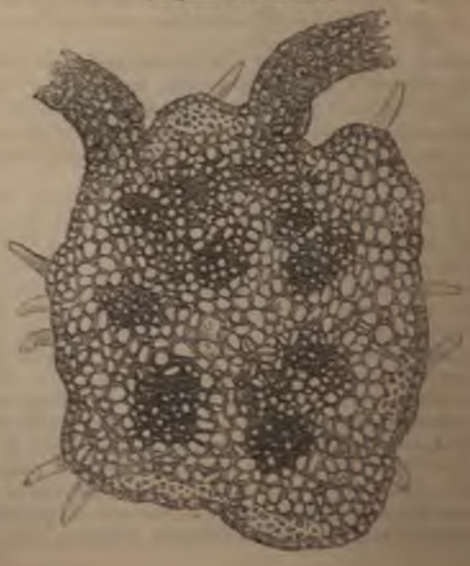
d-rib and veins, as in dock, consist on the outside of small, angular
ceeded by large, reticular cells, which are traversed by bundles of
re and spiral vessels; the differences between the mid-ribs of the

Fig. 154.
Portion of Under Surface of Rhubarb Leaf,
Showing the situation of the cells, one of the short spines or hairs, and also one of the gland-like bodies. Magnified 220 diameters.



leaves of the two plants being in form, and in the absence of distinct rid
the mid-rib of the rhubarb leaf. *Fig.* 155.

Fig. 155.
Transverse Section of Mid-rib of Rhubarb Leaf.
(Magnified 40 diameters.)



mining a sample of tobacco, in order to determine whether it contain r leaf, it is in most cases sufficient to employ an object-glass of one inch tance. If the specimen be genuine, the sections or narrow slips of the luding also occasional transverse sections of the veins, will be seen, with the glandular hairs which are so characteristic of the tobacco leaf.

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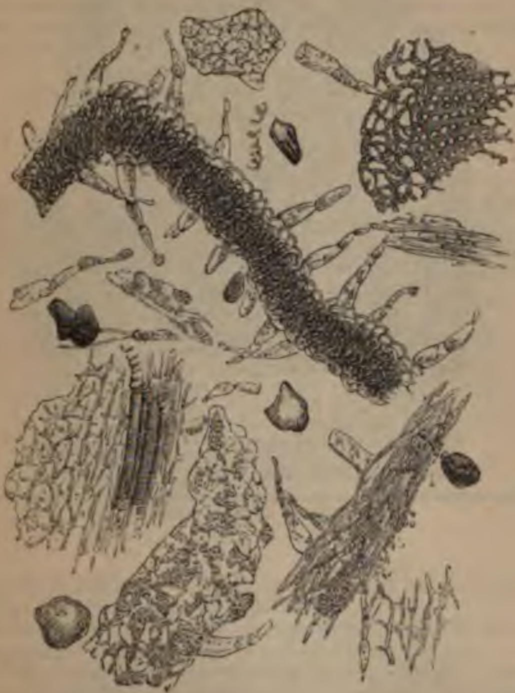
Fig. 156.
GENUINE CUT TOBACCO.
(Magnified 40 diameters.)



e samples of unmanufactured leaf tobacco, full analyses of which have ven in the preceding pages, we are indebted to the courtesy of ogers, tobacco manufacturer, 392. Oxford-street.

vious parts of this Report we described and also showed by numerous ons, the peculiarities of structure presented by the leaves of Tobacco, d Rhubarb. We now proceed to describe the minute organisation of foot or Tussilage leaf, which has been stated to have been sometimes l in the adulteration of tobacco.

lls which form the upper surface of the leaf of coltsfoot are of small ular, and faintly striated, there are but few stomata, and no hairs, the mid-ribs and principal veins. *Fig.* 157.

ructure of the under surface of the leaf differs entirely from that of the The cells are also of small size, but their margins are waved, and the not striated, the stomata are exceedingly numerous, and the whole of ace is clothed with delicate filamentous hairs, which impart the downy to the leaf; intermixed with these are other hairs of much larger size, h, being jointed, bear some resemblance to those of tobacco, but they distinct glandular terminations. *Fig.* 158.

Fig. 157.

PORTION OF UPPER SURFACE OF LEAF OF COLTSFOOT.
(Magnified 220 diameters.)

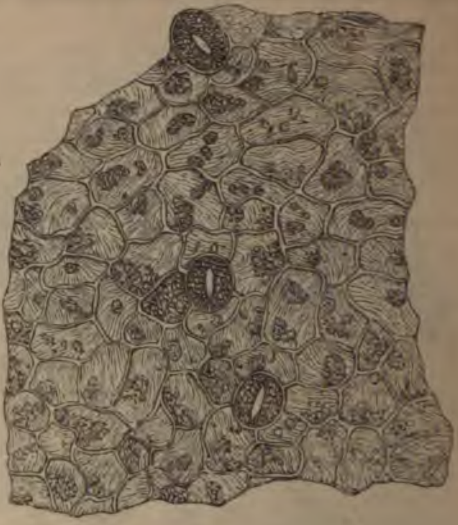
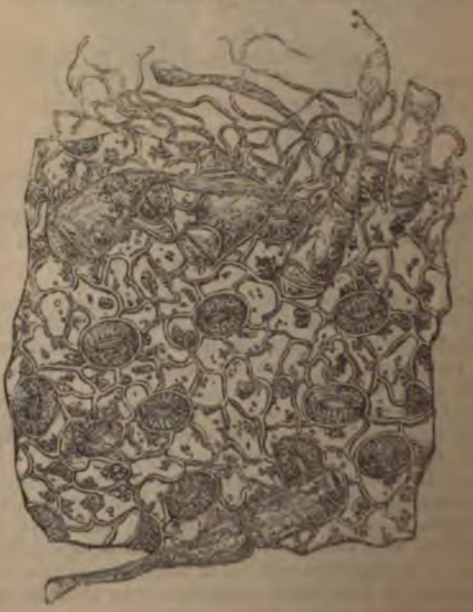


Fig. 158.

PORTION OF UNDER SURFACE OF LEAF OF COLTSFOOT,
Showing the numerous stomata, as also the two kinds of hairs with which this surface of the leaf is invested.



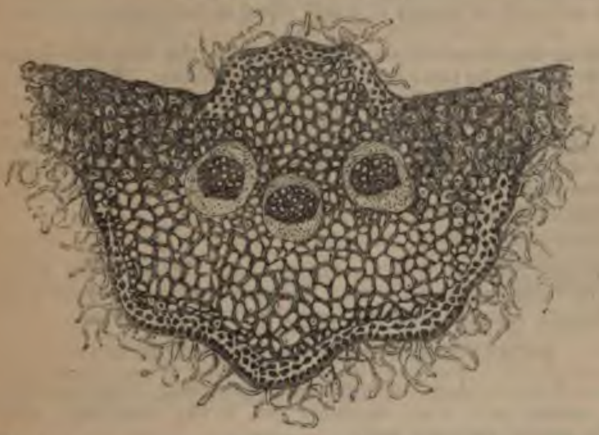
ansverse sections of the leaf-stalk present the following structure:—Exally, there is a well-defined border of distinctly angular cells; from the ide of these spring the two kinds of hairs described above. The central ion of the section is made up of loose cellular tissue similar to that of the -ribs of many other leaves, and it is traversed by from about six to eight dles of woody and vascular tissue, the number usually varying with the The large *leaf-stalks* of the coltsfoot would hardly, however, be used in case for the adulteration of cut tobacco.

ections of the *veins* present a nearly similar conformation; the principal rence is in the number of the bundles which traverse them, there being ost invariably but three such bundles. By this character the veins of the of coltsfoot are at once distinguished from those of the other leaves we have ribed. *Fig.* 159.

Fig. 159.

TRANSVERSE SECTION OF ONE OF THE VEINS OF LEAF OF COLTSFOOT.

(Magnified 40 diameters.)



he following is an outline of the method adopted in the analysis and exnation of the different samples of tobacco:—

00 grains were carefully dried at a temperature of 100° Fahr. until they sed to lose weight, and the amount of moisture determined.

100 grains of each tobacco thus dried were infused in eight ounces of distilled ter; the water was poured cold upon the tobacco; the temperature was raised 170° Fahr., and maintained at that point for forty minutes; the infusion was n allowed to become cold and to stand for twelve hours, when it was strained d evaporated at a temperature of 100°, until it ceased to lose weight; the tract was then weighed and subsequently tested for sugar or glucose.

100 grains of each tobacco, dried as before, were incinerated, the ash weighed, d the insoluble separated from the soluble portion, the amount of each being ertained.

Lastly, each tobacco was examined with the microscope for leaves other than acco, and also for other solid extraneous substances.

The amount of extract obtained from any tobacco varies somewhat even in erent portions of the same leaf treated in precisely the same manner, but en different methods of extraction are followed the results differ still more siderably; the quantity of distilled water used, the temperature to which it aised, and the length of time during which the infusion is kept hot and ceration allowed to continue, will affect the results; when therefore we are irous of obtaining comparative results, the same method of extraction should ll cases be carefully pursued. In procuring the extracts of the six samples unmanufactured tobacco, the analyses of which have already been given, a thod of extraction different from that described above was followed, and ce a considerable variation in the amount of the extracts obtained.

There is little question, therefore, but that, in the majority of cases, the fol ing analyses represent the actual qualities and condition of the vinegars o several manufacturers by whom London is suppled. The samples were not cured direct from the makers, because of the difficulty experienced in obtai them by parties not engaged in the trade.

The same ingenious system as that pointed out above, prevails in the ar mustard. The manufacturer of this prepares three different qualiti double superfine, superfine, and fine—which may be thus characterised: flour and turmeric, and a little mustard; still more flour and turmeric, and mustard; nearly all flour and turmeric, with scarcely any mustard.

In our first Report on Vinegar, the quantity of sulphate of baryta th down, on the addition of chloride of barium, was determined in the follo manner:—

The precipitate was collected on a filter, both being afterwards burned platinum crucible, to get rid of the organic matter, and the residue wei the previously ascertained weight of the ash left by the filter being deducte

In the present case, the precipitates were obtained by decantation; being once or twice washed with distilled water, they were dried in a glass sule, and their weight taken. This method is both more simple and pe more accurate, the only objection to it being, that, in some instances, precipitate requires many hours fully to subside, in consequence of a po being held in suspension by the organic matter contained in the vinegar.

Results of the Chemical Examination of Twenty-eight Samples porting to be from the Vinegars of the different Makers and chants by whom London and its Suburbs are supplied, and as cured from various Grocers, Publicans, and Oilmen.

1st *Sample.*—Purchased of J. Owtram, 6. Connaught-terrace, Edgware- Sold as the vinegar of

R. BURNETT & CO.,
Vinegar Makers,
Vauxhall.

Contains a *considerable quantity of sulphuric acid.* 1000 grains by mea of this vinegar yield 54·46 grains of *acetic acid*, or 5·44 *per cent.*, and of *monohydrated sulphuric acid.*

2nd *Sample.*—Purchased of J. C. Holden, 48. Cambridge-street, Hyde- square. Sold as the vinegar of

R. BURNETT & CO.
Vinegar Makers,
Vauxhall.

Contains a *considerable quantity of sulphuric acid.* 1000 grains yield grains of *acetic acid*, or 5·05 *per cent.*, and 1·54 of *sulphuric acid.*

3rd *Sample.*—Purchased of W. Fontaine, 10. Vere-street, Clare-market. as the vinegar of

R. BURNETT & CO.,
Vinegar Makers,
Vauxhall.

Contains a *considerable quantity of sulphuric acid.* 1000 grains yield grains of *acetic acid*, or 5·18 *per cent.*, and 1·60 of *sulphuric acid.*

4th *Sample.*—Purchased of E. Chappell, 1. Ranelagh-terrace, Pimlico. as the vinegar of

MESSRS. BEAUFOY & CO.,
Vinegar Makers,
Nine Elms.

Contains an *immense quantity of sulphuric acid.* 1000 grains yield grains of *acetic acid*, or 3·51 *per cent.* and 4·00 of *sulphuric acid.*

t *Sample.*— Purchased of J. Christmas, 34. South Audley-street. Sold as the vinegar of

MESSRS. BEAUFOY & CO.
VINEGAR MAKERS,
NINE ELMS.

Contains an *immense quantity of sulphuric acid.* 1000 grains yield 40·12 grains of *acetic acid*, or 4·01 *per cent.*, and 4·02 of *sulphuric acid.*

h *Sample.*—Purchased of R. & C. Faulkner, 44. Jermyn-street. Sold as the vinegar of

MESSRS. POTTS & CO.,
VINEGAR MAKERS,
BRIDGE-STREET, SOUTHWARK.

Contains a *very small quantity of sulphuric acid.* 1000 grains yield 48·33 grains of *acetic acid*, or 4·83 *per cent.*, and ·63 of *sulphuric acid.*

h *Sample.*—Purchased of T. Wood, Bridge-terrace, Harrow-road. Sold as the vinegar of

MESSRS. POTTS & CO.,
VINEGAR MAKERS,
BRIDGE-STREET, SOUTHWARK.

Contains a *very small quantity of sulphuric acid.* 1000 grains yield 48·33 grains of *acetic acid*, or 4·83 *per cent.*, and ·63 of *sulphuric acid.*

h *Sample.*—Purchased of E. Price, 45. Coleshill-street, Pimlico. Sold as the vinegar of

MESSRS. GRIMBLE, PODMORE, & CO.,
VINEGAR MAKERS,
No. 1. NORTH-PLACE, ALBANY-STREET.

Contains *a very considerable quantity of sulphuric acid.* 1000 grains yield 41·99 grains of *acetic acid*, or 4·19 *per cent.*, and 1·86 of *sulphuric acid.*

h *Sample.*—Purchased of S. Hardstaffe, 114. Edgware-road. Sold as the vinegar of

MESSRS. GRIMBLE, PODMORE, & CO.,
VINEGAR MAKERS,
No. 1. NORTH-PLACE, ALBANY-STREET.

Contains *an immense quantity of sulphuric acid.* 1000 grains yield 27·63 grains of *acetic acid*, or 2·76 *per cent.*, and 4·13 of *sulphuric acid.*

th *Sample.*—Purchased of G. Mills, 124. Edgware-road. Sold as the vinegar of

CHAMPION & CO.,
VINEGAR MAKERS,
OLD-STREET-ROAD.

Contains *a very considerable quantity of sulphuric acid.* 1000 grains yield 39·40 grains of *acetic acid*, or 3·94 *per cent.*, and 2·04 of *sulphuric acid.*

th *Sample.*—Purchased of W. Hudson, 16. Crawford-street, Bryanston-square. Sold as the vinegar of

CHAMPION & CO.,
VINEGAR MAKERS,
OLD-STREET-ROAD.

Contains *a very considerable quantity of sulphuric acid.* 1000 grains yield 43·29 grains of *acetic acid*, or 4·32 *per cent.*, and 2·00 of *sulphuric acid.*

2th *Sample.*—Purchased of F. Tuck, 138. St. Alban's-place, Edgware-road. Sold as the vinegar of

MESSRS. HILLS & UNDERWOOD,
VINEGAR MAKERS,
NORWICH.

Does not contain free sulphuric acid. 1000 grains yield 56·38 grains of *acetic acid*, or 5·63 *per cent.*, and ·44 of *combined sulphuric acid.*

3th *Sample.*—Purchased of J. Hopkinson, 132. High Holborn. Sold as the vinegar of

8th Sample.—Purchased of E. & J. Freeman, 3. Wigmore-street. Contains *a small quantity of* COPPER. Ash *somewhat pink.* Solution ash, tested with ammonia, of a *faint blue.*

9th Sample.—Purchased of Crosse & Blackwell, 21. Soho-square. Contains *a good deal of* COPPER. Ash of a *light* but *decided pink.* Sol of the ash, tested with ammonia, becoming of a *pale blue* colour; a co *of copper* also being deposited on a rod of iron immersed in the acid solution.

10th Sample.—Purchased of Castell & Brown, 45. Princes-street, Leic square. *Does not contain copper.* Ash of a *white* colour. The appearance o gooseberries, in this case, differs remarkably from those of all the pre samples. The fruit is of a yellow colour, with scarcely a tinge of g We have seen, in shop-windows at the West-end, gooseberries precise sembling these in colour, and we believe, if inquiries were made, th most cases it would turn out that the parties were supplied by Me Castell & Brown.

GREENGAGES.

11th Sample.—Purchased of G. Whybrow & Co., 4. Minories. Contains *a very considerable quantity of* COPPER. An iron rod immerse the fluid in which the fruit is preserved became covered with *a thick co of copper.* Ash of a *decided and rather deep pink* colour. Solution of ash, tested with ammonia, changed to a *decided blue.*

12th Sample.—Purchased of Crosse & Blackwell, 21. Soho-square. Contains *a very considerable quantity of* COPPER. An iron rod immers the fluid in which the fruit is preserved became *thickly coated all over copper.* Ash of a *decided and rather deep pink* colour; solution of the tested with ammonia changed to a *bright blue.*

13th Sample.—Purchased of E. Lazenby, 6. Edwards-street, Portman-squar Contains *a very considerable quantity of* COPPER. An iron rod immerse the fluid in which the fruit is preserved became *thickly coated with cop* Ash of a *decided and rather deep pink colour*; solution of the ash te with ammonia changed to a *bright blue.*

14th Sample.—Purchased of R. & C. Faulkner, 44. Jermyn-street. Contains a *very considerable quantity of* COPPER. An iron rod immerse the fluid in which the fruit is preserved became *thickly coated* wit *metal.* Ash of a *decided pink colour;* solution of the ash tested ammonia changing to a *bright blue.*

It should be remarked, that in all the above cases, the greengages, as c tained in the bottles, presented to the eye a suspicious and unnatural bluish-green colour, which was much heightened by boiling; in this state fruit exhibited, in fact, the characteristic verdigris hue.

15th Sample.—Purchased of Hedges & Butler, 155. Regent-street. Contains *a trace of copper only.* Ash *nearly white,* with a *shade of pink* and there; solution of ash treated with ammonia became of *a very f blue colour.*

16th Sample.—Purchased of Fortnum & Mason, 182. Piccadilly. Contains *a small quantity of copper.* Ash *decidedly pink;* solution of treated with ammonia became *light blue.*

17th Sample.—Purchased of Castell & Brown, 45. Princes-street, Leices square. Contains *a trace of copper.* Ash *slightly pink here and there.* Solutio ash treated with ammonia became *very faintly blue.* The greengages in case were of large size, firm, and plump, the colour being well prese and natural.

18th Sample.—Purchased of Howis & Masson, 216. Piccadilly. Contains *a very small quantity of* COPPER. Ash *here and there slightly* The greengages in this case were of large size, firm, and plump, the co being well preserved without presenting an unnatural appearance.

le. — Purchased of M. & E. Cannon, 4. Whitechapel-road.
e, 20·40; watery extract, 43·84; soluble ash, 4·20; insoluble ash,
; total ash, 16·60; no *glucose*. All tobacco leaf.

le. — Purchased of H. R. Martin, 107. Bishopsgate-street Within.
e, 21·66; watery extract, 34·56; soluble ash, 3·80; insoluble ash,
; total ash, 18·28; traces only of *glucose*. No solid admixture of any
ption detected.

le. — Purchased of T. Huxley, 13. Whitechapel-road.
e, 20·00; watery extract, 33·48; soluble ash, 4·16; insoluble ash,
; total ash, 16·80; minute traces only of *glucose*. No solid extra-
substance of any kind.

le. — Purchased of R. Lloyd & Sons, 69. Holborn-hill.
e, 20·56; watery extract, 62·20; soluble ash, 4·20; insoluble ash,
; total ash, 16·32; faint traces of *glucose*. No foreign leaves or other
xtraneous mixture.

le. — Purchased of W. Fryer, 13. Smithfield-bars.
e, 19·40; watery extract, 31·20; soluble ash, 3·84; insoluble ash,
total ash, 18·40; traces of *glucose*. No leaves other than tobacco.

le. — Purchased of J. Mullens, 24. Fore-street, Cripplegate.
e, 20·16; watery extract, 40·60; soluble ash, 3·44; insoluble ash,
total ash, 19·68; traces only of *glucose*. No solid extraneous sub-
of any kind.

le. — Purchased of J. Clark, 5. Drury-lane.
e, 20·24; watery extract 29·72; soluble ash, 4·60; insoluble ash,
total ash, 19·56; no *glucose*. No foreign leaves or other solid ad-
re of any description.

ANUFACTURED TOBACCO — ROLL, TWIST, AND SPUN.

CAVENDISH TOBACCO.

le. — Purchased of R. Allen, 131. Shoreditch.
, 25·40; watery extract, 46·64; soluble ash, 4·88; insoluble ash,
total ash, 20·08; evident traces of *glucose*. No leaves other than
o, or solid extraneous substance.

le. — Purchased of J. Roberts, 126. Whitechapel-road.
, 24·04; watery extract, 39·60; soluble ash, 5·52; insoluble ash,
total ash, 18·72; evident traces of *glucose*. No solid extraneous ad-
re of any description.

le. — Purchased of T. Huxley, 13. Whitechapel-road.
re, 31·40; watery extract, 41·60; soluble ash, 3·20; insoluble ash,
total ash, 17·48; evident traces of *glucose*. All tobacco leaf.

le. — Purchased of R. Bready, 43. Cannon-street-road, Commercial-

, 29·22; watery extract, 36·96; soluble ash, 4·00; insoluble ash,
total ash, 16·96; traces of *glucose*. No solid admixture of any kind.

TWIST TOBACCO.

le. — Purchased of Beynon & Stocken, 10. Gracechurch-street.
, 22·46; watery extract, 41·08; soluble ash, 3·40; insoluble ash,
total ash, 19·36; *glucose*, 1·02 per cent. All tobacco leaf, no solid
eous substance of any description.

le. — Purchased of H. Bear, 17. Church-lane, Whitechapel.
, 23·32; watery extract, 32·04; soluble ash, 4·64; insoluble ash,
total ash, 19·32; no *glucose*. No leaves other than tobacco, or other
dmixture.

e. — Purchased of S. Huxley, 13. Whitechapel-road.
, 28·74; watery extract, 45·88; soluble ash, 3·48; insoluble ash,
total ash, 16·28; *glucose*, 0·74 per cent. No solid extraneous sub-
of any kind.

e. — Purchased of M. & E. Cannon, 4. Whitechapel-road.
, 21·46; watery extract, 47·88; soluble ash, 3·88; insoluble ash,
total ash, 15·16; no *glucose*. No solid admixture of any kind.

NEGRO-HEAD TOBACCO.

[illegible] Sample.—Purchased of T. White, [illegible] Shoreditch.
Moisture, [illegible]; watery extract, 4[illegible]; soluble ash, 3·24; insoluble ash, [illegible]; total ash, [illegible]; glucose, [illegible] per cent. No leaves other than tobacco, or [illegible] extraneous substance.

[illegible] Sample.—Purchased of H. Baer, 17 Church-lane, Whitechapel.
Moisture, [illegible]; watery extract, 54·4[illegible]; soluble ash, 4·36; insoluble ash, [illegible]; total ash, [illegible]; glucose, [illegible] per cent. No solid admixture of any kind.

[illegible] Sample.—Purchased of M. & E. Carson, 4, Whitechapel-road.
Moisture, [illegible]; watery extract, 44·54; soluble ash, 3·08; insoluble ash, [illegible]; total ash, [illegible]; but slight traces of *glucose*. All tobacco leaf.

[illegible] Sample.—Purchased of T. Biggs, 29, Norton Folgate.
Moisture, 24·2[illegible]; watery extract, 44·20; soluble ash, 3·72; insoluble ash, 9·72; total ash, 13·44; *glucose*, 1·27 per cent. No solid extraneous substance of any kind.

[illegible] Sample.—Purchased of J. Wright, 4, Barbican.
Moisture, 25·[illegible]; watery extract, 43·20; soluble ash, 3·60; insoluble ash, [illegible]; total ash, 14·[illegible]; traces of *glucose*. No solid admixture of any kind.

[illegible] Sample.—Purchased of S. A. Geller, 9, Newgate-street.
Moisture, 24·[illegible]; watery extract, 30·04; soluble ash, 6·28; insoluble ash, 14·12; total ash, 20·40; *glucose*, 0·45 per cent. All tobacco leaf.

[illegible] Sample.—Purchased of L. Alexander, 65, High Holborn.
Moisture, 24·40; watery extract, 43·70; soluble ash, 3·32; insoluble ash, 1[illegible]; total ash, 14·[illegible]; *glucose*, 3·82 per cent. No solid admixture of any description.

[illegible] Sample.—Purchased of S. Phillips, 174, High Holborn.
Moisture, 24·[illegible]; watery extract, 44·40; soluble ash, 3·80; insoluble ash, 11·40; total ash, 15·20; *glucose*, 2·55 per cent. No leaves other than tobacco, or solid extraneous substance of any kind.

From a full consideration of the whole of the results contained, not only in the following Table of Analyses, but also in the analyses given in a previous portion of this report on Tobacco, we arrive at the following conclusions:—

1st. That the *Tobacco-leaf* itself presents certain peculiarities of structure, by which it may be readily distinguished from the leaves of all other plants said to be employed in the adulteration of tobacco, especially in the form and structure of the hairs, and of the mid-ribs and veins. These peculiarities are so decisive as to enable the observer, by means of the microscope, at once to distinguish tobacco in all the forms of cut and roll tobacco, and even when the leaf is still more minutely divided, as in some kinds of snuffs.

2nd. That the majority of leaves not tobacco which have been detected from time to time in adulterated tobacco also present certain peculiarities in their organisation, by which they may be all distinguished, not only from tobacco, but from each other.

3rd. That while the structure of the tobacco leaf is constant, its composition varies very greatly, particularly as regards the quantity of gum and sugar which it contains, and the amount of ash furnished on incineration: thus we find that in the six samples of unmanufactured *leaf tobacco*, the analyses of which have already been published, the amount of hygrometric moisture varied from 10·8 to 13·4 per cent.; the extract from 40·8 to 60·0 per cent.; the sugar from mere traces to 3·6 per cent.; the gum from 7·4 to 10·1 per cent.; and the ash from 10·6 to 22·6 per cent., it being composed chiefly of chlorides, sulphates, carbonates, and phosphates, combined with much lime. In the eight samples of *leaf-stalk*, the analyses of which are now given, the hygrometric moisture varied from 11·60 to 18·16 per cent.; the extract from 21·04 to 39·85 per cent.; the sugar from traces to 4·91 per cent., and the ash from 20·00 to 28·24, these ashes being remarkable for the large amount of soluble salts which they contained. These differences are evidently so considerable and so varied, as to render it manifest, that by imitating its chemical composition, tobacco may be adulterated to a considerable extent without the possibility of our being able to declare with certainty that it is so adulterated.

Turning now to the analyses of the different kinds of *Manufactured Tobacco*, e notice the following particulars: —

4th. That the amount of moisture in the two *Turkey tobaccos* varied from 11·40 to 12·80 per cent.; the extract from 29·40 to 30·80; the sugar from 0·51 to 0·78; and the ash from 18·68, of which 4·24 was soluble and 14·44 insoluble, to 18·96 per cent., of which 4·96 was soluble and 14·00 insoluble. No adulteration was discoverable with the microscope in either sample.

5th. That in the two samples of *Orinoko tobacco*, the moisture varied from 14·30 to 15·16; the extract from 33·60 to 46·96 per cent.; the ash from 15·60—namely, 6·40 soluble, and 9·20 insoluble—to 20·36, of which 7·60 was soluble and 12·76 insoluble; and the amount of sugar from 2·35 to 3·81 per cent. No adulteration discoverable with the microscope in either sample.

6th. That in the two samples of *K'Naster tobacco* the moisture was respectively 15·68 and 65·76; the extract, 33·16 and 37·56; the ash, 16·04, of which 4·68 was soluble and 11·44 insoluble, and 20·36, of which 5·04 was soluble and 15·32 insoluble; and the *glucose* was 0·66 and 1·36 per cent. No adulteration discoverable with the microscope.

7th. That in the six samples of *Returns tobacco* the amount of moisture varied from 13·40 to 18·06 per cent.; the extract from 30·72 to 51·48 per cent.; the ash from 18·00 to 19·64; and the sugar from faint traces only to 0·88 per cent. No adulteration discoverable with the microscope.

8th. That in the eight samples of *Bird's-Eye tobacco* the moisture varied from 18·00 to 27·06; the extract from 29·32 to 46·52; the ash from 17·68—namely, 7·16 soluble and 10·52 insoluble—to 19·88, of which 6·16 was soluble and 13·72 insoluble; and the *glucose* from faint traces only to 0·97, or nearly one per cent. No adulteration discoverable with the microscope.

9th. That in the twelve samples of *Shag tobacco* the moisture varied from 19·40 to 22·46 per cent.; the extract from 29·72 to 62·20; the ash from 16·32, of which 4·20 was soluble and 12·12 insoluble, to 20·80, of which 7·08 was soluble and 13·72 insoluble; and the *glucose* from faint traces only to 1·22 per cent. No adulteration discoverable with the microscope.

10th. That in the four samples of *Cavendish tobacco* the moisture varied from 24·04 to 29·22; the extract from 36·96 to 46·64; the ash from 16·96, of which 4·00 was soluble and 12·96 insoluble, to 20·08 per cent., of which 4·88 was soluble and 15·20 insoluble; while traces only of glucose were present in any of the samples. No adulteration was discoverable with the microscope.

11th. That in the four samples of *Twist tobacco* the moisture varied from 21·46 to 28·74; the extract from 32·04 to 47·88; the ash from 15·16, of which 3·88 was soluble and 11·28 insoluble, to 19·36, of which 3·40 was soluble and 15·96 insoluble; and the glucose from traces only to 1·02 per cent. No adulteration discoverable with the microscope.

12th. That in the eight samples of *Negrohead tobacco* the moisture varied from 9·80 to 28·66; the extract from 34·48 to 44·84; the ash from 14·68, of which 3·60 was soluble and 11·08 insoluble, to 20·40, of which 6·28 was soluble and 14·12 insoluble; and the amount of glucose varied from slight traces only to 3·82, or nearly four per cent. No adulteration discoverable with the microscope.

Taking, then, the whole of the above results into consideration, we find: —

13th. That in the *Unmanufactured Tobaccos*, including stalk,
The hygrometric moisture varied from 11·25 to 22·96 per cent.
The extract, from 23·20 to 51·20.
The soluble ash, from 3·00 to 11·44.
The insoluble ash, from 9·60 to 17·80.
The total ash, from 13·60 to 27·90.
The sugar, *from traces to 4·91.*

First six months of 1854.	Stemmed - - - -	8,369,479 lbs.
	Unstemmed - - - -	6,708,942 „
	Manufactured and foreign snuff, and foreign cigars - - -	113,446 „

ADULTERATION OF TOBACCO.

At the Wandsworth police-court, a short time since, a Mr. Piddie was summoned by the Excise authorities for keeping and selling tobacco adulterated with saccharine matter, and from the conclusive evidence adduced, was pronounced guilty, and mulcted in the usual penalty for such an offence.

The samples were given to Dr. R. D. Thomson, Lecturer on Chemistry at St. Thomas's Hospital, for analysis, who, to detect the adulteration, employed the fermentation test, distilling off the alcohol from the fermented infusion of the tobacco. It was thus proved, from several experiments conducted on a large scale, that no less than 9½ per cent. of sugar had been added to the tobacco in question.

As confirmatory proof that the tobacco had been adulterated, the Excise officers contrived to procure samples of the same leaf of which the tobacco had been manufactured. This was also submitted to analysis by the fermentation test, and traces only of saccharine matter were detected. So decisive were the results obtained by these comparative analyses of both the manufactured tobacco and the leaf from which it was made, that the magistrates had not much difficulty in arriving at the conclusion that the sample in question was adulterated with sugar. It is in all cases necessary, unless the per-centage of sugar be very great indeed, to obtain a portion of the original leaf for the sake of comparison, and this can rarely be procured unless by the Excise officers, who have the power of entering upon the premises of parties suspected.

Another and more recent seizure of adulterated tobacco has been effected by the excise officers, and information laid before the magistrates. The following are the details: —

The case was been heard at Bow-street police-court, against Ellen Secker and John M'Culloch, carrying on the business of a tobacco manufacturer at Goodman-street, Islington, and who had been summoned at the instance of the Board of Inland Revenue, to answer the charges of being engaged in the adulteration of tobacco, and of having the fraudulent materials in their possession.

It appears that from certain information received, the officers of excise paid a visit to the factory so early as six o'clock in the morning, but could not obtain admission until the men came to work. As soon as entry was gained, the search was commenced, and a large quantity of tobacco was found in the presses in process of manufacture, from which a suspicious looking fluid was dropping; on tasting this, it was found to be sweet; a sample of it was taken, and the search continued. In a large trough, in which the tobacco leaf had evidently been steeped, a considerable quantity more of this liquid or syrup was found, and on going to an out-house used as a kitchen, they discovered a full-sized copper set in brick-work; and on the floor several pans and vessels, all of which contained a good deal more of the syrup, together with some lime. Samples of each of these were taken, as well as of the manufactured leaf, and of the cut tobacco; these were submitted to analysis by the excise chemist, who found the whole of them to contain crystallisable sugar and lime.

During the time search was being made, one of the defendants, M'Culloch, having been sent for by one of the workmen, came into the factory; he was very indignant, and became much excited, demanding to know who had dared to enter his premises. On finding that they were excise officers, he immediately upset the contents of the vessels on to the floor, and ordered one of his men to throw down water to wash the fluid away; but the officers informed him that it was useless, as they had already possessed themselves of samples which were quite sufficient to convict him of the offence. The plea set up by the female defendant was, that although she was proprietess of the business, still, not understanding the manufacture of tobacco, she had left it in the hands of the

That in the *Manufactured Tobaccos*—

The hygrometric moisture varied from 9·80 to 65·76.

The extract, from 29·32 to 62·20.

The soluble ash, from 3·24 to 7·60.

The insoluble ash, from 9·20 to 16·24.

The total ash, from 14·68 to 20·80.

The sugar, from traces to 3·82.

That in the *Bird's-Eye Tobaccos* the soluble ash was very high, in sequence of the large quantity of mid-ribs which these tobaccos contain.

That the extract from the *Negroheads and Twists* was in some cases usually high, as was also the quantity of glucose; these large extracts re probably, in part, due to the oil employed in the manufacture of these ds of tobacco, but principally to the use of some saccharine solution.

That not one of the *Forty Samples* of manufactured cut tobacco was lterated with any foreign leaf, or with any insoluble or organic extraous substance of any description other than with sugar or some other charine matter, which there is good reason to believe was present in eral instances. The more common adulterations of tobacco consist in addition of water, sugar, and salts. The presence of these, in amount ficient to constitute adulteration, can only be declared with certainty, wever, when they are in considerable excess, or by a comparison of the manufactured and manufactured leaf.

results are assuredly very different from those which might have been ted, taking into consideration the notions which prevail generally t the public with respect to the adulteration of tobacco, and also the high which this article is subject. The absence of any very great or extenlteration is to be explained, we apprehend, by the constant supervision d over the manufacture of tobacco on the part of the excise.

ugh taking a limited number of samples of tobacco, we do not find tion to be by any means common, yet we must not conclude from this bacco is never adulterated with foreign leaves and other solid and e substances. The excise returns show that it occasionally is so, the of excise making from time to time, in the warehouses, &c., of tobacco cturers, seizures of dock, rhubarb, coltsfoot, and other leaves, as well as iety of other vegetable and mineral substances.

ave before us the particulars of numerous seizures of adulterated tobacco, and snuff, made by the Excise for the years ended January, 1851 and To these we shall again have occasion to refer more in detail at the ion of the Reports on Cigars and Snuff.

y future analyses of tobacco which may be made, we would recommend sugar be estimated both by the copper and fermentation tests, as by ner test any cane sugar which might be present would not be detected. reacle is employed, it is almost impossible to ascertain the exact amount this consists not only of glucose, but also of albumen, colouring matter, er extractive and feculent matters.

luty on Tobacco is,—

	s.	*d.*	
Unmanufactured - - - -	3	$1\frac{8}{10}$	per lb.
Manufactured and Cigars - - -	9	$5\frac{4}{10}$	,,
Snuff - - - - - -	6	$3\frac{6}{10}$	,,

uantities entered for home consumption were, in

852	Stemmed - - - - -	18,787,812 lbs.
	Unstemmed - - - -	9,571,097 ,,
	Manufactured foreign snuff, and foreign cigars included - - -	199,845 ,,
853	Stemmed - - - - -	18,439,637 ,,
	Unstemmed - - - -	11,081,412 ,,
	Manufactured and foreign snuff, and foreign cigars - - - -	216,512 ,,

intense a green as to impart to the fruit as seen through the bottle a deep green colour.

As a rule, the amount of copper ordinarily present in many kinds of bottled fruits and vegetables, is greater for even equal quantities than of pickles, which, as we some months since showed, also frequently contain the metal in large and almost poisonous quantity. Add to this the fact that while pickles are used in small quantity only, a whole bottle of preserved fruit is consumed by two or three persons at one time; hence we perceive how much more dangerous is the employment of copper in the case of fruits than in that of pickles.

The present adds another instance to the many which have already been adduced, in which manufacturers, in order to heighten the colour of articles, and as they conceive, often very erroneously, to preserve their appearance, have sacrificed their flavour and quality, and have risked health, and even safety.

"*To the Editor of* THE LANCET.

SIR,—Having taken considerable interest in the reports of the Analytical Sanitary Commission, I too have had my eyes opened to the necessity of watchfulness in the purchase of articles of food. Of this I will give you a late instance.

I had bought a bottle of preserved gooseberries from one of the most respectable grocers in this town, and had had its contents transferred into a pie. It struck me that the gooseberries looked fearfully green when cooked; and on eating one with a steel fork, its intense bitterness sent me in search of the sugar. After having sweetened and mashed the gooseberries with the same steel fork, I was about to convey some to my mouth, when I observed the prongs to be completely coated with a thin film of bright metallic copper. My testimony can be borne out by the evidence of three others, two of whom dined at my table.

It is a fortunate circumstance that, considering the frequent presence of copper in pickles and preserves, its detection is so easy. I hope you will excuse my troubling you.

I remain, Sir, yours respectfully,
ALBERT J. BERNAYS, F.C.S., &c.

Chemical Laboratory, Derby, Jan. 1853.

Our correspondent's communication is in many respects valuable, especially as showing the dangerous adulterations practised by the manufacturers of bottled fruits, and also the correctness of the Analytical Sanitary Commission; but it is deficient in the most important point—viz., Mr. Bernays has omitted to give the name of the party from whom the preserved gooseberries were procured. Why should all the respectable grocers in Derby be exposed to suspicion, because one of them has sold preserved gooseberries strongly impregnated with a poisonous solution? The name of the vendor should be published; and his integrity will not be impugned in the slightest degree, if he, in his turn, publishes the name and address of the manufacturer by whom he was supplied with the poisonous commodity. The publication of the names and addresses of the offending parties has been throughout the boldest feature of our Commission, and has excited for it universal attention and respect.—ED. L."

MESSRS. CROSSE AND BLACKWELL.

The following remarks appeared in THE LANCET recently, amongst Answers to Correspondents:—

"The samples were entirely free from copper. The practice referred to, of imparting to bottled and preserved fruits and vegetables a bright green colour by means of a poisonous salt of copper, still prevails extensively. Nothing can be more pernicious than this practice; it has, however, received a considerable check by the publication of the Reports of the Analytical Sanitary Commission on this subject. One firm we know, that of Messrs. Crosse and Blackwell whose establishment is the most extensive of any engaged in this branch of workmen. M'Culloch pleaded that he could not be liable as he was only an gent. The court thought otherwise, and found both guilty, Secker being fined 00*l.*, and M'Culloch 200*l.* Of course the whole of the utensils and machinery sed in the factory were condemned and removed from the premises.

It appears that M'Culloch formerly held a responsible situation in the cus-oms, and being an intelligent man, had at one time been selected to commence course of study to qualify him as an examiner and chemist to the excise; he hus perhaps imagined that he knew the way by which he could more easily defraud the revenue without risk.

CIGARS, AND THEIR ADULTERATIONS.

The second form in which manufactured tobacco is consumed is that in which the leaves are rolled up into cigars and cheroots. The use of tobacco in this form has been rapidly advancing within the last few years, the cheaper penny cigars taking the place, to a great extent, of cut tobacco, although the consumption of both, from the growing taste of the public for tobacco-smoking, has been for some time, and still is, on the increase.

The process employed for making cigars and cheroots in England is precisely the same as that adopted in other countries. It is as follows:—

The leaves are first slightly moistened with water; they are then "stripped," that is, the midribs are removed in the same manner as described in a former report on the Manufacture of Cut Tobacco, by which means each leaf is separated into two parts; the half-leaves are next smoothed out by the hand, and put under a slight pressure, to remove any creases which may have occurred in the packing. This first process is generally the work of a woman or boy, who, seated near the cigar-maker, hands up the half-leaves as fast as they are required.

The "cigar-maker" is seated in front of a stout wooden bench, made somewhat like a butler's tray, it being furnished with raised edges on three of its sides, but open on that next the workman. He takes one of the half-leaves, and by means of a very sharp knife cuts it into the form of a section of the rind of an orange; upon this a sufficient quantity of fragments and cuttings of leaf are placed, and the "maker" proceeds to roll them up, and fashion them into the well-known form of a cigar or cheroot; over this, again, a long narrow strip of tobacco-leaf, of rather a better quality and appearance, termed the "wrapper," is spirally rolled; this is twisted at the smaller end into a kind of knot, to prevent its becoming loosened. The cigar is next placed against a gauge made of iron, and cut from its thick end to the required length. Great dexterity is requisite in the making of cigars, and the work proceeds with the utmost rapidity, a few seconds only being employed in the manufacture of each. After the cigars are removed from the makers' hands, they are placed on open trays in a room artificially heated, in order to thoroughly dry them; they are then weighed, and packed in boxes of various sizes for sale.

Cigars and cheroots are known in the trade by a variety of different names, taken either from the name of the country from whence they are imported, or the kinds of leaf from which they are made, while in other cases the name of the maker or the caprice of the manufacturer determines the name. Thus we have Havannah, St. Lucia, Cuba, and Dutch Cigars, and Chinsura and Manilla Cheroots; Columbia and Amersfoort Cigars; Cabana, Silva, and Lopez Cigars, and the innumerable fanciful names that have at various times been given them, as Principes, Fragancias, Panetellas, Kings, Queens, Imperials, and a host of other names, the only distinguishing characters being their size, colour, make, and form. The above names all relate to foreign cigars and cheroots.

British cigars and cheroots are most frequently made in imitation of the most famous and saleable varieties of the above, and take their names from them. It should be mentioned, however, that nearly all the cigars sold as Cubas are

Results of the Microscopical, Chemical, and General Examinatio
Twenty-eight Samples of Anchovies, purchased of Oilmen, Gro
and Bottlers of this Fish, resident in the Metropolis.

1st *Sample.*—Purchased of G. Whybrow, 4. Minories. In diamond-sh
bottle. Price 1*s.*
Consisting entirely of Dutch fish; the fish, as well as the brine, bein
tensely coloured with an immense quantity of a ferruginous earth, re
bling *Venetian red*, or *reddle*.

2nd *Sample.*—Purchased of Batty & Feist, 102. Leadenhall-street. In sq
bottle. Price 1*s.* 6*d.*
Fish and brine deeply coloured with a considerable quantity of red ferrugi
earth, resembling *Venetian red*.

3rd *Sample.*—Purchased of C. Wix & Son, 22. Leadenhall-street. In
Price 1*s.* 6*d.*
Brine of a brownish colour, and does not contain *Venetian red*, *bole A*
nian, or any other red ferruginous earth.

4th *Sample.*—Purchased of T. Snelling, 30. Fenchurch-street. In square bo
Price 1*s.*
Fish, as well as the brine, highly coloured with a large quantity of red ea
resembling *Venetian red*, which falls to the bottom as a copious precipit

5th *Sample.*—Purchased of E. Fenning, 5. Poultry. In glass barrel. P
1*s.* 6*d.*
Brine rendered thick with *wheat-flour*, and slightly coloured with a red ea
resembling *bole Armenian*.

6th *Sample.*—Purchased of J. Wingrave, 90. St. Paul's Churchyard. In squ
bottle. Price 1*s.* 3*d.*
Brine of a deep brown colour, from admixture with a large quantity of
earth, resembling *bole Armenian*.

7th *Sample.*—Purchased of J. Burgess & Son, 107. Strand. In square bot
Price 1*s.* 6*d.*
Brine decidedly coloured with a red earth, resembling *Venetian red*.

8th *Sample.*—Purchased of J. Prosser, 202. Fleet-street. In diamond-sha
bottle. Price 1*s.*
Fish *mixed*, consisting in part of Dutch fish; the brine being highly colo
with a considerable quantity of red earth, probably *Venetian red*.

9th *Sample.*—Purchased of Phythian, 430. West Strand. In bottle having
it the label of Messrs. Crosse & Blackwell. Price 1*s.* 3*d.*
Brine decidedly coloured with red earth, probably *bole Armenian*.

10th *Sample.*—Purchased of J. E. Imbrie, Strand. In square bottle. Pric
Consisting entirely of Dutch fish; the brine being vividly coloured wit
immense quantity of a bright red earth, like *Venetian red*, which fal
the bottom, forming a copious precipitate.

11th *Sample.*—Purchased of J. Weston, 26. Hungerford-market. In diam
shaped bottle. Price 1*s.*
The fish and the brine intensely coloured with an enormous quantity
reddish-brown earth, resembling *bole Armenian*; drachms of the earth m
be obtained from this bottle.

12th *Sample.*—Purchased of Trowell & Co., 93. St. Martin's-lane. In
glass barrel. Price 6*d.*
Fish and brine very highly coloured with a large quantity of a reddish e
resembing *bole Armenian*; about a third of the contents of this bar
made up of *rock salt, scales, and broken fragments of fish*.

13th *Sample.*—Purchased of J. Scott, 18. Coventry-street. In square b
Price 1*s.*
Fish *mixed*, consisting in part of Dutch fish, highly coloured with
Armenian.

14th *Sample.*—Purchased of J. Quinn, 40. Haymarket. In square b
Price 1*s.* 6*d.*
Brine decidedly coloured with a red earth; resembling *Venetian red*, wh
visible as a sediment at the bottom of the vessel. Nearly a third o
contents of this consisted of *bay salt*, scales, and broken fragments of

15th Sample. — Purchased of Messrs. Beynon & Stocken, 10. Gracechur street.
No adulteration.

16th Sample. — Purchased of H. R. Martin, 107. Bishopsgate-street Within.
No adulteration.

17th Sample. — Purchased of J. Wright, 4. Barbican.
No adulteration.

18th Sample. — Purchased of T. Smith, 132. Aldersgate-street.
No adulteration.

19th Sample. — Purchased of W. Fryer, 13. Smithfield-bars.
No adulteration.

20th Sample. — Purchased of R. Lloyd & Sons, 69. Holborn-hill.
No adulteration.

PRINCIPE CIGARS.

21st Sample. — Purchased of H. Bear, 1. Church-lane, Whitechapel.
No adulteration.

22nd Sample. — Purchased of G. F. Chance, 163. Fenchurch-street.
No adulteration.

23rd Sample. — Purchased of H. Benjamin, 16. High-street, Aldgate.
No adulteration.

CHEROOTS.

BENGAL CHEROOTS.

24th Sample. — Purchased of J. Glinister, 29. Park-place, Mile-end-road.
No adulteration.

25th Sample. — Purchased of R. Bready, 43. Cannon-street-road, Commerci road.
No adulteration.

26th Sample. — Purchased of A. Isaacs, 80. Whitechapel-road.
No adulteration.

27th Sample. — Purchased of M. & E. Cannon, 4. Whitechapel-road.
No adulteration.

28th Sample. — Purchased of W. Frankford, 61. Whitechapel-road.
No adulteration.

29th Sample. — Purchased of T. Huxley, 13. Whitechapel-road.
No adulteration.

CHEROOTS.

30th Sample. — Purchased of J. Glinister, 29. Park-place, Mile-end-road.
No adulteration.

31st Sample. — Purchased of H. Bear, 1. Church-lane, Whitechapel.
No adulteration.

32nd Sample. — Purchased of A. Isaacs, 80. Whitechapel-road.
No adulteration.

33rd Sample. — Purchased of J. De Sola & Co., 120. High-street, Whitechap
No adulteration.

34th Sample. — Purchased of M. & E. Cannon, 4. Whitechapel-road.
No adulteration.

35th Sample. — Purchased of M. Pinheiro, 143. Whitechapel-road.
No adulteration.

36th Sample. — Purchased of W. Frankford, 61. Whitechapel-road.
No adulteration.

37th Sample. — Purchased of W. Fryer, 13. Smithfield-bars.
No adulteration.

38th Sample. — Purchased of J. Mullens, 24. Fore-street, Cripplegate.
No adulteration.

39th Sample. — Purchased of J. Wright, 4. Barbican.
No adulteration.

40th Sample. — Purchased of T. Smith, 132. Aldersgate-street.
No adulteration.

kinds of fish besides the Dutch are commonly imported and sold as " anchovies," and "real Gorgonas,"—namely, French and Sicilian fish.

The *French* fish or anchovy is caught off the coasts of Nantz and Nice, a imported into this country in barrels packed in brine made with rock salt.

This fish closely resembles in its characters the true anchovy, and is prob of the same genus. Like the anchovy, it is deprived of its head and intesti but the scales, and not unfrequently the brachial rays and pectoral fins, entire. Moreover, the fish is usually somewhat larger, thicker across the b tapers more towards the tail, and the flesh much whiter than the Gorg anchovy. These differences, however, are not sufficiently marked in gen to allow of this fish, *when bottled*, being satisfactorily distinguished from true anchovy, by an ordinary observer. Its commercial value is about one- that of the Gorgona anchovy.

The *Sicilian* fish resembles the anchovy closely, but is smaller than the G gona, of which, by some, it is considered to be the young. Whether it b state of that species, or of the same genus, we are not able to determine w certainty; its value is at least one-third less than that of the Gorgona anch

Now, we have no doubt but that the majority of the above samples consi entirely of one or other of these fish, but we hesitate to pronounce a posi opinion in each case. Although it is not difficult to distinguish French and Sicil fish from the Gorgona anchovy, when first taken from the barrels in which th are imported, yet, when contained in bottles, the discrimination is ofte matter of considerable difficulty, and in many cases is even scarcely possi This arises from the squeezing and mutilation of the fish in the process bottling, as well as from the altered appearance due to the red earthy matt with which they are commonly covered. Whether those engaged in the tr know of any practical characters by which the discrimination of the fish, e when thus altered, may be effected, we are not certain.

We have, however, much reason to think that the Sicilian and French f notwithstanding the near resemblance which exists, may be distinguished, experienced persons, even when bottled, from the true anchovy. With a v to determine this point we forwarded to a person engaged in the anchovy tra twelve of the above samples, each being labelled with a distinct number; following is his Report. The numbers given below do not correspond with th of the samples:—

1. Gorgona.
2. French fish.
3. Ditto.
4. Gorgona, not fine.
5. Sicilian Fish.
6. Gorgona.
7. Dutch, inferior.
8. Sicilian, good quality.
9. Gorgona.
10. Dutch Fish.
11. Sicilian.
12. Sicilian, best quality.

If this list be correct, then NOT ONE-THIRD OF THE TWENTY-EIGHT SAM EXAMINED CONSISTS OF GORGONA ANCHOVIES.

The Dutch fish may be distinguished from the true anchovy, by its being variably deprived of its scales, by its large size, white flesh, general coarse and by the very evident scale-marks which extend over the whole surface. fins have the same disposition as the true anchovy, the same number of r and it is possible that this fish may be one of the genus *Engraulis*, of which are three or even more species.

The French, and especially the Dutch, fish are not only of much less v but also greatly inferior as an article of diet to the true anchovy. The diffe in the cost of the anchovy and Dutch fish may be estimated by the fact, dealers find it worth their while to mix them in different proportions in the same bottle. There is no difficulty in distinguishing the Dutch fish b characters pointed out above; but it would be very difficult to discrim between the larger samples of the French anchovies, when denuded of scales, and that which in this article is denominated *Dutch fish*, and hen infer that the two may possibly be separate states and conditions of one a same species.

In none of the samples have we met with either sprats or sardines, alt *there* is no doubt that both these fish have been, and are still occasionally bout ten ounces of cold water, which had been slightly acidified by the addition f a few drops of acetic acid. The liquid was then filtered off, and partially recipitated with basic acetate of lead, by which means a considerable proportion f colouring matter was thrown down. The solution was next refiltered, treated ith three drachms of animal charcoal, and allowed to digest for twenty-four ours, frequently agitating it; by this means it became further decolorised, and ost its bitter taste. The charcoal was then collected on a filter, and boiled with wo portions of rectified spirit, each of about the same bulk as the liquid originlly employed. The spirit, which had acquired a slight greenish-yellow tint, was submitted to distillation, so that it should not be wasted, and it left behind n extract of a yellowish colour, having a bitter taste; this was purified by washng on a filter with weak liquor ammoniæ, then with ether, and lastly, with rectified spirit; this was now evaporated, and the residue treated on a white porcelain plate, with a little per-oxide of manganese, and a drop of concentrated sulphuric acid; and if morphia had been present, even in only very small quantity, the residue would have assumed a rich violet tint, similar to that which occurs with strychnia when treated in a similar way.

1st Sample.— Purchased of M. & E. Cannon, 4. Whitechapel-road.
Does not contain *opium*.
2nd Sample.— Purchased of T. Huxley, 14. Whitechapel-road.
No *opium*.
3rd Sample.— Purchased of M. Pinheiro, Whitechapel-road.
No *opium*.
4th Sample.— Purchased of T. Bewley, 49. Strand.
No *opium*.
5th Sample.— Purchased of H. J. Skinner, 3. St. Martin's-court.
No *opium*.
6th Sample. — Purchased of F. Pontet, 60. Charing-cross.
No *opium*.
7th Sample.— Purchased of Messrs. Wishart & Lloyd, Coventry-street.
No *opium*.
8th Sample. — Purchased of Messrs. Fribourg & Pontet, 121. Pall-mall.
No *opium*.
9th Sample.— Purchased of M. Loftus, 63. Haymarket.
No *opium*.
10th Sample.— Purchased of Messrs. Fribourg & Treyer, 34. Haymarket.
No *opium*.
11th Sample. — Purchased of J. N. Harrison, 15. St. James's-street.
No *opium*.
12th Sample. — Purchased of W. Simmonds, 62. Piccadilly.
No *opium*.

It does not appear, therefore, after a most careful analysis of numerous samples, and notwithstanding the generally received opinion, that Manilla cheroots usually contain opium. The difficulties attending an organic analysis of this kind are very great, but the results obtained appear to be of a character to be fully relied upon, since, by the process above given, so little as one quarter of a grain of crude opium may be satisfactorily detected in a single cheroot to which that drug has been purposely added.

SNUFF, AND ITS ADULTERATIONS.

The third and last form in which the tobacco-leaf is employed is in the state of a more or less finely-reduced powder, constituting snuff.

Snuff is made principally from the stalks or "*strippings*" of the leaf which are rejected in the processes of manufacturing cut tobacco and cigars; some snuffs, however, contain a proportion of leaf as well as stalk.

Snuff is met with in commerce in two states—namely, the dry and the moist. Of each of these there are several varieties, the characters which distinguish them depending, in most cases, upon differences in the processes of manufacture, in the relative proportion of the stalk and leaf, in the degree of moisture, in the flavour or pungency, and in the scenting.

The dry snuffs are in general much more finely ground than the moist: the different kinds of Scotch, Irish, and Welsh are comprised under this head.

The moist snuffs, of which there are a great many varieties, are known in the trade under the following names: Brown and Black Rappee, John Bull, Hardham's 37, Princeza, French and Dutch Carrotte, Masulapatam, Prince's Mixture, Grand Cairo, and a great many others, which derive their names either from the fancy of the maker or the fashion of the day.

In the manufacture of the different varieties of snuff, the process adopted depends upon the kind required to be made. Scotch snuff, which is said to be the purest of all, is made almost entirely from the stalks of tobacco; and this being a dry snuff, as little moisture as possible is added—merely sufficient to prevent the finer particles from escaping and being lost in the act of powdering or grinding, which would otherwise occur. The stalks, cut up into small pieces, are introduced into a kind of iron mortar or "*mull*," as it is termed. This is furnished with a pestle, heavily weighted, the handle of which is connected with a set of jointed arms or levers, so adjusted as to give it a peculiar rotary and grinding motion, this being the best calculated to effect the reduction of the stalks to powder. A series of twenty or thirty, or more, of these mortars or "mulls" are arranged and fixed on a strong oak table, with similar machinery attached to the pestles of each, and all of which are capable of being worked at the same time by means of a steam-engine and connecting shafts and wheels. After the snuff has been reduced to the requisite degree of fineness, it is removed from the "mulls," and dried and flavoured according to a process peculiar to the different manufacturers.

Irish and Welsh snuffs are also dry snuffs; but before the stalks are reduced to powder, they are subjected to a roasting process in closed cylinders, which assists in imparting the peculiar smell by which these snuffs are characterised. These two varieties of dry snuff are ground in mills of a similar description to those employed in the powdering of Scotch snuff: lime-water, and even powdered lime, frequently enter into the composition both of Welsh and Irish snuff. Indeed the addition of the former is allowed by the Excise laws. The most celebrated of the Irish snuffs is that manufactured by the firm of Lundy Foot and Co., of Dublin, and from which it takes its name.

On account of the high duty, over 6*s.* per pound, to which foreign manufactured snuff is subject, but a very small quantity is ever imported and passed through the Custom House, as it can be made in England quite equal in quality to the foreign, and for less than half the duty charged upon the latter. Indeed, preference is in general given to English-made snuffs.

The different varieties of the rappees or moist snuffs are likewise made chiefly from stalks, but a small proportion of the leaf is also introduced, as well as the finer parts and siftings of cut tobacco called "*smalls*," which are too fine to be conveniently smoked in a pipe.

The process followed in the manufacture of moist snuffs differs somewhat from that just described. The stalks cut into fragments, pieces of leaf, and smalls, are well moistened, and ground in a mill of the following construction:—A pair of very heavy cylindrical stones (in form like the common grindstone), six or eight feet in diameter, and a foot or eighteen inches thick, are set up on edge, parallel to each other, and a few inches apart, on a wooden slab or bed slightly hollowed out. These stones have a twofold motion given to them—a rotary one on their own horizontal axis, and a traversing rotary motion round the surface of the bed, similar to the two wheels of a carriage going round in a s circle; this motion is communicated to them by means of an upright shaft d by machinery. The ingredients for the snuff are placed upon the bed, an broad edge of the massive stones passing repeatedly over them, combi their rotary, grinding motion, soon reduces them to powder. The co and working of this kind of snuff-mill is the same as that used in powder, or for crushing the apples in the manufacture of cyd

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w drops of acetic acid. The liquid was then filtered off, and partially
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iring matter was thrown down. The solution was next refiltered, treated
ree drachms of animal charcoal, and allowed to digest for twenty-four
frequently agitating it; by this means it became further decolorised, and
bitter taste. The charcoal was then collected on a filter, and boiled with
tions of rectified spirit, each of about the same bulk as the liquid origin-
ployed. The spirit, which had acquired a slight greenish-yellow tint,
omitted to distillation, so that it should not be wasted, and it left behind
act of a yellowish colour, having a bitter taste; this was purified by wash-
a filter with weak liquor ammoniæ, then with ether, and lastly, with
d spirit; this was now evaporated, and the residue treated on a white
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pium.
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opium.
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ff is made principally from the stalks or "*strippings*" of the leaf which
jected in the processes of manufacturing cut tobacco and cigars; some
, however, contain a proportion of leaf as well as stalk.

1st. That *seven* of the samples were entirely free from sulphuric acid, or o of vitriol.

2nd. That *eighteen* were adulterated with that powerful and corrosi mineral acid, the amount of which was variable, and often very considerabl from ·63, the lowest, to 6·02, the highest quantity in 1000 grains.

3rd. That *two* of the samples contained it in very small quantity only.

4th. That in *three* samples it was present in considerable amount.

5th. That *six* contained it in very considerable amount.

6th. That in *seven* samples it was present in immense quantity.

7th. That the acetic acid also varied very considerably in amount in differe samples, the highest proportion being, in 1000 grains by measure, 56 grains, or 5·66 per cent., and the lowest, 27·63, or only 2·76 per cent.

8th. That in *eight* samples, the acetic acid was present in amount over fo per cent., which is above the standard strength.

9th. That in *twelve* samples the quantity exceeded *four* per cent.

10th. That in *seven* it was over *three* per cent.

11th. That in *one* the quantity of acetic acid present was so exceedingly small a to be *under three* per cent.,—that is, but little more than half the proper strength

12th. That the vinegars which were ascertained to be *free* from sulphuric acid or oil of vitriol were those of the following makers:—

MESSRS. HILL, EVANS, AND CO.,
WORCESTER.

MESSRS. HILLS AND UNDERWOOD,
NORWICH.

MESSRS. SWANN AND CO.,
STOURPORT.

The London agents for this vinegar are—

MESSRS. WILKINSON AND SMETHURST,
NAG'S HEAD BUILDINGS,
BOROUGH.

Here also ought to be mentioned the firm of

MESSRS. POTTS AND CO.,
BRIDGE-STREET, SOUTHWARK,

since the amount of sulphuric acid detected in the samples of their vinegar submitted to examination was so exceedingly small, that they might be considered nearly free from that acid.

To the names of the above makers who do not use sulphuric acid in the manufacture of their vinegars, we may add those referred to in a previous report, of

MESSRS. KENT AND SONS,
UPTON-ON-SEVERN.

The fact of the vinegars of these different makers being found to be entirely free from sulphuric acid, we regard as most important, since it proves most convincingly that the use of that highly objectionable acid, even in small quantities, is not necessary to ensure the preservation of vinegar, and shows that its addition is made rather for the purpose of increasing its apparent strength.*

Families may manufacture for themselves, by a simple process, the whole of the vinegar they require either for the table or for the purpose of pickling, and so make themselves independent of the vinegar-maker, and insure the purity of the article, and its freedom from oil of vitriol.

Sugar or treacle contains the elements out of which, under a new arrangement, vinegar may be formed, the only thing necessary to the change being the addition of a suitable ferment. This is found in the form of a fungus, which under the name of the *vinegar-plant*, has been employed in different pa the country for inducing the requisite fermentation.

We were favoured, some months ago, with the following particulars in r ence to the vinegar-plant, by Mr. Fletcher, surgeon, Bromsgrove:—

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* In page 372. it is stated that an improvement in the manufacture of Malt Vinegar was inve *Mr. Ham of Norwich*; this is erroneous, as the inventor and patentee of the improvement was the la John Ham of Bristol.

0·3; *earthy phosphates*, 2·2; *alkaline sulphates*, 2·0; *oxide of iron and alumina*, 3·8; and *silica*, 5·4 grains.

d *Sample.* — Purchased of J. Roberts, 126. Whitechapel-road.

Vegetable tissue all tobacco; ash, dull brown, intermixed with yellow, amounting to 30·40 per cent., 30·8 of which consisted of *chloride of sodium*, 7·0; *alkaline carbonates*, 0·4; *earthy carbonates*, 5·8; *alkaline phosphates*, 1·0; *earthy phosphates*, 1·8; *alkaline sulphates*, 0·8; *oxide of iron and alumina*, 1·2; *chromate of lead*, 4·4; and *silica*, 8·4 grains.

h *Sample.* — Purchased of G. F. Chance, 163. Fenchurch-street.

No vegetable tissue other than tobacco; ash, dark yellowish-brown, amounting to 20·18 per cent., 18·6 of which was composed of *chloride of sodium*, 4·2; *alkaline carbonates*, 2·1; *earthy carbonates*, 3·8; *alkaline phosphates*, 0·9; *earthy phosphates*, 2·0; *alkaline sulphates*, 1·2; *oxide of iron and alumina*, 1·4; *chromate of lead*, 1·2; and *silica*, 1·8 grains.

th *Sample.*—Purchased of T. Ryder, 28. Chiswell-street, St. Luke's.

Vegetable tissue entirely tobacco; ash, dull reddish-brown, amounting to 28·02 per cent., 26·8 of which was composed of *chloride of sodium*, 6·0; *earthy carbonates*, 5·0; *alkaline phosphates*, 1·6; *earthy phosphates*, 3·4; *alkaline sulphates*, 3·0; *oxide of iron and alumina*, 1·8; *chromate of lead*, 3·2; and *silica*, 2·8 grains.

h *Sample.* — Purchased of S. Phillips, 174. High Holborn.

Vegetable tissue all tobacco; ash dark-reddish brown intermixed with yellowish brown, amounting to 35·54 per cent., 32·6 of which consisted of *chloride of sodium*, 2·0; *alkaline carbonates*, 2·9; *earthy carbonates*, 5·4; *alkaline phosphates*, 1·1; *earthy phosphates*, 2·6; *alkaline sulphates*, 5·4; *oxide of iron and alumina*, 2·0; *bichromate of potash*, 6·2; and *silica*, 5·0 grains.

h *Sample.* — Purchased of P. Proctor, 197. Bishopsgate-street Without.

Vegetable tissue entirely tobacco; ash, blackish-brown, fused into a mass, amounting to 26·52 per cent., 26·6 of which consisted of *chloride of sodium*, 7·0; *alkaline carbonates*, 2·1; *earthy carbonates*, 5·6; *alkaline phosphates*, 5·5; *earthy phosphates*, 2·0; *alkaline sulphates*, 1·2; *oxide of iron and alumina*, 1·8; and *silica*, 1·4 grains.

SCENTED SCOTCH.

h *Sample.* — Purchased of M. Pinheiro, 143. Whitechapel-road.

Vegetable tissue entirely tobacco; ash, dull yellowish-brown, amounting to 22·60 per cent., 21·0 of which was composed of *chloride of sodium*, 1·4; *alkaline carbonates*, 0·8; *earthy carbonates*, 5·4; *alkaline phosphates*, 0·4; *earthy phosphates*, 2·7; *alkaline sulphates*, 2·2; *oxide of iron and alumina*, 0·8; *bichromate of potash*, 5·9; and *silica*, 1·4 grains.

h *Sample.* — Purchased of M. & E. Cannon, 4. Whitechapel-road.

No vegetable tissue other than tobacco; ash, deep rusty brown, amounting to 26·24 per cent., of which 23·8 was composed of *chloride of sodium*, 5·6; *earthy carbonates*, 2·8; *alkaline phosphates*, 6·6; *earthy phosphates*, 1·8; *alkaline sulphates*, 1·0; *chromate of lead*, 2·8; and *silica*, 3·2 grains.

WELSH SNUFFS.

th *Sample.*—Purchased of R. Bready, 43. Cannon-street-road, Commercial-road.

Vegetable tissue all tobacco; ash, blackish-gray, partly fused, amounting to 28·66 per cent., of which 22·8 was composed of *chloride of sodium*, 5·6; *alkaline carbonates*, 3·2; *earthy carbonates*, 5·2; *alkaline phosphates*, 1·8; *earthy phosphates*, 3·6; *alkaline sulphates*, 1·0; and *silica* 0·6 grains.

th *Sample.* — Purchased of J. Glinister, 29. Park-place, Mile-end-road.

Vegetable tissue all tobacco; ash, blackish-grey, amounting to 20·00 per cent., 18·00 of which was composed of *chloride of sodium*, 0·6; *alkaline carbonates*, 3·4; *earthy carbonates*, 5·4; *alkaline phosphates*, 4·6; *earthy phosphates*, 2·4; *alkaline sulphates*, 0·8; and *silica*, 0·8 grains.

th *Sample.* — Purchased of J. Roberts, 126. Whitechapel-road.

Vegetable tissue entirely tobacco; ash, dark grey, amounting to 18·26 per cent., of which 15·8 was composed of *chloride of sodium*, 1·0; alkaline car-

" I have been told," writes Mr. Mitchell, " by many parties, that
profits are made annually by the manufacture of a spurious anchovy
common sprat ; and not only
confined to those who sell the
even private families deceive t
into the idea that 'anchovy'
at least as good as the real fish
cases, they are as good as the
as anchovies, which, indeed, a
but prepared sprats. This is,
easily detected, for the appe
the two fish is very different.
tive examination of the form
chovy and the sprat will suffic
out the distinguishing charact
each, in such a marked manne
fraud is very apparent.

According to M'Culloch, "
dine, a fish which is flatter a
than the anchovy, is frequent
tuted for it."

Before proceeding to give t
of the examination and an
various samples of anchovies,
in the metropolis, we insert a
figure, as also a scientific desc
the fish, taken from Yarrell's
work on the British Fishes.

" *Generic Characters.*—Dist
from the herring in having
pointed : the upper jaw the lo
mouth deeply divided ; the o
tending backwards behind t
the eyes; the gape branchial
very large ; the ventral fins i
of the line of the commencem
dorsal ; abdomen smooth ;
tegous rays twelve.

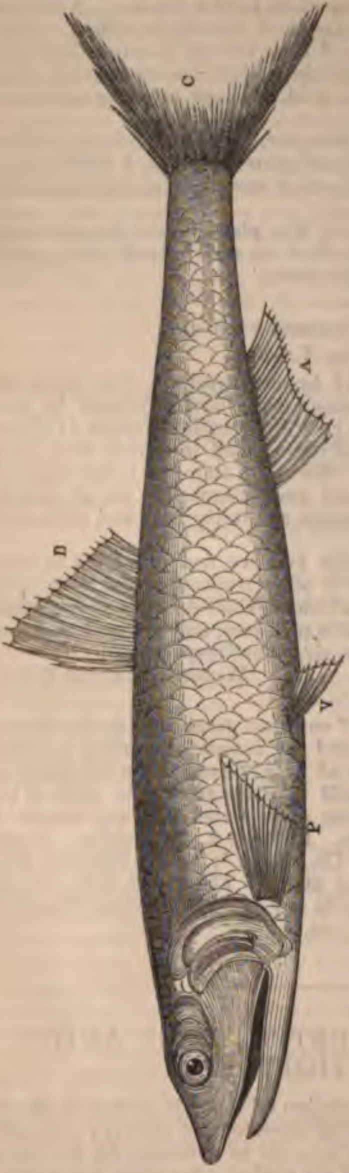
" I have followed Dr. Fl
preserving to the anchovy the
by which it was formerly know
called *Lycostomus*, from the f
mouth ; and *Engraulis encras*
cause, from its bitterness, it
posed to carry its gall in its h
this reason, the head, as w
entrails, are removed when
pickled.

" The anchovy is a comm
the Mediterranean, from Gree
raltar, and was well known to t
and Romans, by whom the li
pared from it, called *garum*, wa
estimation. Its eastern range is
into the Black Sea.

" The fishing for them is
during the night, and lights
with the nets.

" The anchovy is commo
coasts of Portugal, Spain, an
it occurs, I have no doubt, at
nel Islands, and has been taken on the Hampshire coast, and in

Fig. 144.
THE TRUE ANCHOVY.
Engraulis encrasicolus, FLEMING.



D, dorsal fin ; P, pectoral fin ; V, ventral fin ; A, anal fin ; C, caudal fin.

; *earthy phosphates*, 2·2; *alkaline sulphates*, 2·0; *oxide of iron and*
nina, 3·8; and *silica*, 5·4 grains.

ple.—Purchased of J. Roberts, 126. Whitechapel-road.
able tissue all tobacco; ash, dull brown, intermixed with yellow,
unting to 30·40 per cent., 30·8 of which consisted of *chloride of sodium*,
; *alkaline carbonates*, 0·4; *earthy carbonates*, 5·8; *alkaline phosphates*, 1·0;
hy phosphates, 1·8; *alkaline sulphates*, 0·8; *oxide of iron and alumina*,
; *chromate of lead*, 4·4; and *silica*, 8·4 grains.

ple.—Purchased of G. F. Chance, 163. Fenchurch-street.
getable tissue other than tobacco; ash, dark yellowish-brown, amounting
0·18 per cent., 18·6 of which was composed of *chloride of sodium*, 4·2;
line carbonates, 2·1; *earthy carbonates*, 3·8; *alkaline phosphates*, 0·9;
hy phosphates, 2·0; *alkaline sulphates*, 1·2; *oxide of iron and alumina*,
; *chromate of lead*, 1·2; and *silica*, 1·8 grains.

ple.—Purchased of T. Ryder, 28. Chiswell-street, St. Luke's.
able tissue entirely tobacco; ash, dull reddish-brown, amounting to
2 per cent., 26·8 of which was composed of *chloride of sodium*, 6·0;
hy carbonates, 5·0; *alkaline phosphates*, 1·6; *earthy phosphates*, 3·4;
line sulphates, 3·0; *oxide of iron and alumina*, 1·8; *chromate of lead*,
; and *silica*, 2·8 grains.

ple.—Purchased of S. Phillips, 174. High Holborn.
able tissue all tobacco; ash dark-reddish brown intermixed with yellow-brown, amounting to 35·54 per cent., 32·6 of which consisted of *chloride*
sodium, 2·0; *alkaline carbonates*, 2·9; *earthy carbonates*, 5·4; *alkaline*
sphates, 1·1; *earthy phosphates*, 2·6; *alkaline sulphates*, 5·4; *oxide of*
and alumina, 2·0; *bichromate of potash*, 6·2; and *silica*, 5·0 grains.

ple.—Purchased of P. Proctor, 197. Bishopsgate-street Without.
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; *earthy phosphates*, 2·0; *alkaline sulphates*, 1·2; *oxide of iron and*
nina, 1·8; and *silica*, 1·4 grains.

SCENTED SCOTCH.

ple.—Purchased of M. Pinheiro, 143. Whitechapel-road.
able tissue entirely tobacco; ash, dull yellowish-brown, amounting to
0 per cent., 21·0 of which was composed of *chloride of sodium*, 1·4;
line carbonates, 0·8; *earthy carbonates*, 5·4; *alkaline phosphates*, 0·4;
hy phosphates, 2·7; *alkaline sulphates*, 2·2; *oxide of iron and alumina*,
; *bichromate of potash*, 5·9; and *silica*, 1·4 grains.

ple.—Purchased of M. & E. Cannon, 4. Whitechapel-road.
getable tissue other than tobacco; ash, deep rusty brown, amounting to
4 per cent., of which 23·8 was composed of *chloride of sodium*, 5·6;
hy carbonates, 2·8; *alkaline phosphates*, 6·6; *earthy phosphates*, 1·8;
line sulphates, 1·0; *chromate of lead*, 2·8; and *silica*, 3·2 grains.

WELSH SNUFFS.

ple.—Purchased of R. Bready, 43. Cannon-street-road, Commercial-
l.
ble tissue all tobacco; ash, blackish-gray, partly fused, amounting to
6 per cent., of which 22·8 was composed of *chloride of sodium*, 5·6;
line carbonates, 3·2; *earthy carbonates*, 5·2; *alkaline phosphates*, 1·8;
hy phosphates, 3·6; *alkaline sulphates*, 1·0; and *silica* 0·6 grains.

ple.—Purchased of J. Glinister, 29. Park-place, Mile-end-road.
ble tissue all tobacco; ash, blackish-grey, amounting to 20·00 per
., 18·00 of which was composed of *chloride of sodium*, 0·6; *alkaline*
onates, 3·4; *earthy carbonates*, 5·4; *alkaline phosphates*, 4·6; *earthy*
phates, 2·4; *alkaline sulphates*, 0·8; and *silica*, 0·8 grains.

ple.—Purchased of J. Roberts, 126. Whitechapel-road.
ble tissue entirely tobacco; ash, dark grey, amounting to 18·26 per
., of which 15·8 was composed of *chloride of sodium*, 1·0; *alkaline car-*

[illegible] grains.

[illegible]

[illegible] amounting to [illegible] [illegible] phosphates, 2·3; [illegible] and alumina, [illegible]

[illegible] — [illegible] Whitechapel-road. [illegible] amounting to [illegible] [illegible] earthy [illegible] phosphates, 1·4; [illegible] and silica, 2·2 grains.

[illegible] — [illegible] Messrs. F[illegible] & S[illegible], 10, Gracechurch-street [illegible] clay-fawn, amounting to 24·2 [illegible] of sodium, 7·6; earthy [illegible] phosphates, 1·6; [illegible] 1·2; chromate of lead, [illegible]

[illegible] — [illegible] T. H[illegible], 18, Whitechapel-road. [illegible] dirty reddish-brown, amounting to [illegible] consisted of chloride of sodium, 7·8; earthy [illegible], 5·0; earthy phosphates, 1·2; [illegible] alumina, 1·0; and silica, 0·6 grains.

SCENTED RAPPEE.

[illegible] — Purchased of H. Benjamin, 16, High-street, Aldgate.

egetable tissue all tobacco; ash, reddish-brown, amounting to 27·22 per cent., 26·2 of which consisted of *chloride of sodium*, 6·8; *alkaline carbonates*, 0·1; *earthy carbonates*, 5·8; *alkaline phosphates*, 0·3; *earthy phosphates*, 2·6; *alkaline sulphates*, 2·2; *oxide of iron and alumina*, 4·0; and *silica*, 4·4 grains.

his sample was found to contain a proportion of *powdered orris-root;* it is able that it was not used as an adulteration, but merely for the purpose ommunicating a scent to the snuff.

Sample.— Purchased of H. Bear, 1. Church-lane, Whitechapel.

egetable tissue entirely tobacco; ash, deep, reddish-brown, amounting to 28·26 per cent., 28·0 of which consisted of *chloride of sodium*, 6·0; *alkaline carbonates*, 0·3; *earthy carbonates*, 3·0; *alkaline phosphates*, 2·5; *earthy phosphates*, 1·0; *alkaline sulphates*, 2·0; *oxide of iron and alumina*, 5·0; *oxide of lead*, traces; and *silica*, 8·2 grains.

his sample also contained a small quantity of *powdered orris-root.*

Sample.— Purchased of H. R. Martin, 107. Bishopsgate-street Within.

egetable tissue all tobacco; ash, deep greyish-brown, amounting to 22·74 per cent., of which 22·0 was composed of *chloride of sodium*, 7·4; *alkaline carbonates*, 0·9; *earthy carbonates*, 2·6; *alkaline phosphates*, 3·9; *earthy phosphates*, 0·6; *alkaline sulphates*, 1·8; *oxide of iron and alumina*, 2·8; *oxide of lead*, traces; and *silica*, 2·0 grains.

BLACK RAPPEE.

Sample.— Purchased of J. Glinister, 29. Park-place, Mile-end-road.

egetable tissue consisting entirely of tobacco; ash, blackish-brown, amounting to 23·52 per cent., 23·6 of which was composed of *chloride of sodium*, 4·2; *earthy carbonates*, 4·0; *alkaline phosphates*, 7·0; *earthy phosphates*, 2·4; *alkaline sulphates*, 1·2; *oxide of iron and alumina*, 1·4; and *silica*, 3·4 grains.

Sample.— Purchased of T. Huxley, 13. Whitechapel-road.

egetable tissue all tobacco; ash, light-brown, amounting to 24·75 per cent., of which 20·8 consisted of *chloride of sodium*, 5·4; *earthy carbonates*, 4·4; *alkaline phosphates*, 0·5; *earthy phosphates*, 2·0; *alkaline sulphates*, 1·8; *oxide of iron and alumina*, 1·0; *bichromate of potash*, 3·7; and *silica*, 2·0 grains.

Sample.— Purchased of R. Gifford, 121. Holborn-hill.

egetable tissue all tobacco; ash, dark-brown, intermixed with yellowish-brown amounting to 24·04 per cent., 22·0 of which consisted of *chloride of sodium*, 9·0; *alkaline carbonates*, 0·3; *earthy carbonates*, 5·2; *alkaline phosphates*, 1·3; *earthy phosphates*, 1·6; *alkaline sulphates*, 1·4; *oxide of iron and alumina*, 0·8; and *silica*, 2·4 grains.

Sample.— Purchased of H. Bear, 1. Church-lane, Whitechapel.

egetable tissue all tobacco; ash, greyish-brown, amounting to 22·28 per cent., 21·0 of which was composed of *chloride of sodium*, 6·4; *alkaline carbonates*, 0·3; *earthy carbonates*, 5·4; *alkaline phosphates*, 1·1; *earthy phosphates*, 1·4; *alkaline sulphates*, 1·0; *oxide of iron and alumina*, 0·8; and *silica*, 4·6 grains.

Sample.—Purchased of J. Harman, 4. St. John-street, Smithfield.

egetable tissue all tobacco; ash of a deep umber-brown, amounting to 28·24 per cent, 26·0 of which consisted of *chloride of sodium*, 6·4; *earthy carbonates*, 7·6; *alkaline phosphates*, 3·2; *earthy phosphates*, 4·6; *alkaline sulphates*, 1·8; *oxide of iron and alumina*, 1·8; and *silica*, 0·6 grains.

Sample.—Purchased of J. Johnson, 38. Little Queen-street, Holborn.

egetable tissue all tobacco; ash, dark brownish-grey, amounting to 22·26 per cent., of which 21·0 consisted of *chloride of sodium*, 6·0; *alkaline carbonates*, 0·4; *earthy carbonates*, 6·0; *alkaline phosphates*, 0·6; *earthy phosphates*, 2·0; *alkaline sulphates*, 1·2; *oxide of iron and alumina*, 1·2; and *silica*, 3·8 grains.

Sample.— Purchased of H. Arnett, 10. High Holborn.

egetable tissue entirely tobacco; ash, light brownish-fawn, amounting to 25·84 per cent., 24·8 of which consisted of *chloride of sodium*, 8·8; alkaline car-

[illegible] *phosphates*, 2·0; [illegible] *and alumina*, [illegible]

[illegible]'s No. 37.

[illegible] Whitechapel-road. [illegible] ash, dark-brown, nearly [illegible] was composed of *chl*[illegible] *ates*, 2·0; [illegible] *phosphates*, 1·4; [illegible]

[illegible] High-street, Aldgate. [illegible] light brown, amounting to [illegible] *sodium*, 5·8; [illegible] *phosphates*, 2·2; [illegible] *and alumina*, [illegible]

[illegible] Bishopsgate-street Without. [illegible] ash, amounting to [illegible] *sodium*, 7·[illegible] [illegible] 0·8 grains.

[illegible]

[illegible] Bishopsgate-street Without. [illegible] per cent., of which [illegible] 4·2; *alkaline* [illegible] 1·4; [illegible]

[illegible] Fenchurch-street. [illegible] greyish-grey, amounting [illegible] *ide of sodium*, [illegible] 1·4; *earthy phosphates*, [illegible] 0·4, and silica, [illegible]

[illegible]'s Mixture.

[illegible] Park-place, Mile-end-road. [illegible] greyish-grey, almost black, amounting [illegible] *of sodium*, 7·8; *alkalin*[illegible] 1·4; *alkaline phosphates*, 0·6; *earth*[illegible] *of iron and alumina*, 1·[illegible]

[illegible] M. & E. [illegible], 4 Whitechapel-road. [illegible] ash, dull-brown, amounting to [illegible] *of sodium*, 7·2; *alkaline* [illegible] *phosphates*, 2·2; [illegible] *of iron and alumina*, [illegible]

[illegible] Whitechapel-road. [illegible] ash, dark greyish-brown, amounting to 18·[illegible] *sodium*, 7·2; *alkaline* [illegible] 4·4; *alkaline phosphates*, 0·1; [illegible] *of iron and alumina*, 0·8; [illegible]

[illegible] Shoreditch High-street. [illegible] ash, dark greyish-brown, amounting [illegible] consisted of [illegible] *of sodium*, 8·0; *alkaline* [illegible] 4·8; [illegible] *phosphates*, 0·6; *earthy* [illegible] 1·2; [illegible] *of iron and alumina*, 1·[illegible]

[illegible] H. R. Martin, 107, Bishopsgate-street Within. [illegible] other than that of tobacco; ash, blackish-grey, amounting

20th Sample. — Purchased of Mr. Hughes, 12. King-street, St. James's. Sold in bottle, and labelled

ROYAL STANDARD VINEGAR,
Manufactured entirely from
MALT,
And highly recommended for its purity and strength. Stated to have been sold by
MESSRS. BULL & AMBLER,
VINEGAR MERCHANTS, BILLITER-STREET.

Contains *an enormous quantity of sulphuric acid.* 1000 grains yield 44·13 grains of *acetic acid*, or 4·41 *per cent.*, and 6·02 of *sulphuric acid.*

21st Sample. — Purchased of J. Holmes, 180. Brick-lane, Whitechapel. Sold as the vinegar of

MESSRS. BUMSTEAD & Co.,
VINEGAR MERCHANTS, 86. LOWER THAMES-STREET.

Contains *a very considerable quantity of sulphuric acid.* 1000 grains yield 34·40 grains of *acetic acid*, or 3·44 *per cent.*, and 2·60 of *sulphuric acid.*

From information we have received, we believe that this vinegar, as also that of the succeeding sample, was made by Mr PANTER, of Bristol.

22nd Sample.— Purchased of F. Duckett, 18. High-street, Kensington; and sold as the vinegar of

MESSRS. BUMSTEAD & Co.,
VINEGAR MERCHANTS, 86. LOWER THAMES-STREET.

Contains *a very considerable quantity of sulphuric acid.* 1000 grains yield 38·65 grains of *acetic acid*, or 3·86 *per cent.*, and 2·31 of *sulphuric acid.*

23rd Sample. — Purchased of Mr. Moore, Hickman's-folly, Dock-head, Bermondsey. Sold as the vinegar of

MESSRS. TAYLOR,
VINEGAR MAKERS, LONG-LANE, BERMONDSEY.

Contains a *very considerable quantity of sulphuric acid.* 1000 grains yield 40·60 grains of *acetic acid*, or 4·06 *per cent.*, and 1·90 of *sulphuric acid.*

24th Sample. — Purchased of Mr. Messent, 42. St. George's-street, Ratcliffe-highway. Sold as the vinegar of

MESSRS. TAYLOR,
VINEGAR MAKERS, LONG-LANE, BERMONDSEY.

Contains a *very considerable quantity of sulphuric acid.* 1000 grains yield 51·56 grains of *acetic acid*, or 5·15 *per cent.*, and 2·39 of *sulphuric acid.*

25th Sample. — Purchased of G. Pike, 77. High-street, Borough. Sold as the vinegar of

MESSRS. PAYNE & SLEE,
VINEGAR MAKERS, 6. CHURCH-STREET, HORSLEYDOWN.

Contains *an enormous quantity of sulphuric acid.* 1000 grains yield 32·74 grains of *acetic acid*, or 3·27 *per cent.*, and 5·51 of *sulphuric acid.*

26th Sample. — Purchased of W. Ingram, Broadway, Hammersmith Sold as the vinegar of

MESSRS. PAYNE & SLEE,
VINEGAR MAKERS, 6. CHURCH-STREET, HORSLEYDOWN.

Contains *an immense quantity of sulphuric acid.* 1000 grains yield 46·72 grains of *acetic acid*, or 4·67 *per cent.*, and 3·88 of *sulphuric acid.*

27th Sample.—Purchased of Mr. Portch, 3. Silver-street, Notting-hill. as the vinegar of

MESSRS. WILKINSON & SMETHURST,
VINEGAR MERCHANTS, NAG'S HEAD-BUILDINGS, BOROUGH.

Does not contain sulphuric acid. 1000 grains yield 47·70 grains of *acid*, or 4·77 *per cent.*, and ·42 of *combined sulphuric acid.*

From information received, we believe that this vinegar, as also that succeeding sample, were made by Messrs. SWANN & Co., Stourport.

28th Sample.—Purchased of Warton & Co., 13. North Audley-street, Gros square. Sold as the vinegar of

MESSRS. WILKINSON & SMETHURST,
VINEGAR MERCHANTS, NAG'S HEAD-BUILDINGS, BOROUGH.

Does not contain sulphuric acid. 1000 grains yield 45·87 grains of *acid*, or 4·58 *per cent.*, and ·56 of *combined sulphuric acid.*

The results contained in the above analyses will be more fully compreh as arranged in the three following tables.

TABLE I.

Table showing the Results of the Analysis of Twenty-eight Sampl Vinegar.

No.	Retailers.	Makers.	Dried Carbonate of Soda required to Neutralise 1000 Grains.	Pure Acetic Acid in 1000 Grains.	Acetic Acid, per cent.	Monohydrated Sulphuric A or Vitriol in 1000 Grains.
1	J. Owtram.	R. Burnett & Co.	58·00	54·46	5·44	Considerable -
2	J. C. Holden.	R. Burnett & Co.	54·00	50·50	5·05	Considerable -
3	W. Fontaine.	R. Burnett & Co.	55·30	51·84	5·18	Considerable -
4	E. Chappell.	Beaufoy & Co.	40·60	35·13	3·51	An immense quantity -
5	J. Christmas.	Beaufoy & Co.	45·80	40·12	4·01	An immense quantity -
6	R. & C. Faulkner.	Potts & Co.	50·80	48 33	4·83	A very small quantity -
7	T. Wood.	Potts & Co.	50·80	48·33	4·83	A very small quantity -
8	E. Price.	Grimble & Podmore.	45·50	41·99	4·19	Very considerable -
9	S. Hardstaffe.	Grimble & Podmore.	34·50	27 63	2·76	An immense quantity -
10	G. Mills.	Champion & Co.	43·00	39·40	3·94	Very considerable -
11	W. Hudson.	Champion & Co.	47 00	43·29	4·32	Very considerable -
12	F. Tuck.	Hills & Underwood.	58·50	56·38	5·63	None.
13	J. Hopkinson.	Hills & Underwood.	58·80	56·66	5·66	None.
14	J. Leigh.	Hill, Evans, & Co.	56·00	51·84	5·18	None.
15	J. Swinge.	Hill, Evans, & Co.	37·50	33·57	3·35	None.
16	C. Batty.	Hill, Evans, & Co.	54·00	49·24	4·92	None.
17	Smith & Tyers.	J. P. Osborne.	49·00	44·77	4·47	Very considerable. -
18	W. Fontaine.	J. P. Osborne.	40·30	35·19	3·51	An immense quantity -
19	W. Fontaine.	J. P. Osborne.	57·00	52·33	5·23	Very considerable -
20	W. Hughes.	J. P. Osborne.	53 50	44 13	4·41	Most of all -
21	J. Holmes.	Panter & Co.	38·50	34·40	3·44	Very considerable -
22	F. Duckett.	Panter & Co.	42·50	38 65	3·86	Very considerable -
23	Mr. Moore.	Taylor & Co.	44·10	40·60	4 06	Very considerable -
24	Mr. Messent.	Taylor & Co.	56·00	51·56	5·15	Very considerable -
25	G. Pike.	Payne & Slee.	40 00	32·74	3·27	An enormous quantity -
26	W. Ingram.	Payne & Slee.	52·50	46·72	4·67	An immense quantity -
27	Mr. Portch.	Swann & Co.	49·50	47·70	4·77	None.
28	Warton & Co.	Swann & Co.	47·60	45·87	4·58	None.

From the quantities of sulphuric acid given in the following table a deduction should be made for that portion which exists in a state o bination, and which is derived from the ingredients from which the is prepared. The quantity of combined acid varies considerably in d samples; we have found it to range between ·44 and ·39 in 1000 grains, *in the* case of Messrs. Hill, Evans, & Co.

RTY-THREE SAMPLES OF VARIOUS SNUFFS,

bular Form.

romate ot·ash.	Silica.	Ash analysed.	Total Ash per cent.	Colour of Ash.	Effervescence of Carbonic Acid Gas liberated from Cold Infusion on the addition of Hydrochloric Acid.	No. of Sample.
-	4·0	26·2	26·52	Dull rusty brown.	Slight.	1
-	5·4	29·6	30·34	Blackish-brown.	Very considerable.	2
-	8·4	30·8	30·40	Dull brown intermixed with yellow.	Traces only.	3
-	1·8	18·6	20·18	Dark yellowish brown.	Slight.	4
-	2·8	26·8	28·02	Dull reddish-brown.	Very considerable.	5
5·2	5·0	32·6	35·54	Dark reddish-brown, intermixed with yellowish-brown.	Considerable.	6
-	1·4	26·6	26·52	Blackish-brown, fused into a mass.	Slight traces.	7
5·9	1·4	21·0	22·60	Dull yellowish-brown.	Slight.	8
-	3·2	23·8	26·34	Deep rusty brown.	Ditto.	9
-	0·6	22·8	28·66	Blackish-grey, partly fused.	Rather much.	10
-	0·8	18·0	20·00	Ditto ditto.	None.	11
-	0·8	15·8	18·26	Dark grey, partly fused.	Traces only.	12
-	0·9	28·0	29·94	Yellowish-grey, ditto.	Considerable.	13
-	0·6	28·0	28·72	Light greyish-fawn colour.	Immense.	14
-	1·0	19·2	21·20	Pale grey.	Very slight.	15
-	1·0	18·6	20·12	Grey, partly fused.	None.	16
-	0·4	17·4	19·32	Dark reddish-brown.	Slight.	17
-	2·0	21·6	23·24	Ditto ditto.	Rather much.	18
-	2·2	19·6	21·08	Light dull brown.	Ditto.	19
-	3·4	23·6	24·[illegible]2	Light ochry-fawn.	Slight.	20
-	0·6	19·2	21·24	Dirty reddish-brown.	Very considerable.	21
-	4·4	26·2	27·22	Reddish-brown.	Rather much.	22
-	8·2	28·0	28·26	Deep reddish-brown.	Slight.	23
-	2·0	22·0	22·74	Deep greyish-brown.	Very considerable.	24
-	3·4	23·6	23·52	Blackish-brown.	None.	25
3·7	2·0	20·8	24·75	Light brown.	Ditto.	26
-	2·4	22·0	24·04	Dark brown, intermixed with yellowish-brown.	Rather much.	27
-	4·6	21·0	22·28	Greyish-brown.	Very slight.	28
-	0·6	26·0	28·24	Deep umber-brown.	Immense.	29
-	3·8	21·0	22·26	Dark brownish-grey.	Very slight.	30
-	2·6	24·8	25·84	Light brownish-fawn.	Rather much.	31
-	1·6	19·6	25·52	Dark brown, nearly black.	Mere trace.	32
-	3·4	25·6	26·44	Rather light brown.	Immense.	33
-	3·8	22·0	22·92	Greyish-brown.	Considerable.	34
-	1·2	19·6	19·96	Dirty reddish-brown.	None.	35
-	3·6	20·6	23·94	Light brownish grey.	Ditto.	36
-	2·0	20·4	21·32	Dark grey, nearly black.	Slight traces.	37
-	1·8	20·2	21·26	Dull brown.	Rather much.	38
-	3·0	17·6	18·72	Dark greyish-brown.	Traces only.	39
-	1·8	20·0	22·08	Ditto ditto.	Rather much	40
-	1·6	20·8	22·64	Blackish-grey.	Very considerable.	41
-	1·6	21·6		-wn.	Slight.	42
-	5·2	30·0		-brown.	None.	43

with of any other material, or any other liquid, or substance, or matter, or thing than water only, or in manufacturing any snuff, make use therewith of any other material, or any other liquid, or substance, or matter, or thing, than water or water and salt, or alkaline salts only, or lime-water in snuff known as Welsh or *Irish* snuff;" and it also enacts, "That every manufacturer of tobacco who shall make use of, or shall add to, or mix with, or put into or amongst, or permit to be added to, or mixed with, any other material, liquid, substance, matter, or thing, than as respects tobacco, water only, and as respects snuff water or salt, or water and salt, or alkaline salts only, or lime-water in snuff known as Welsh or Irish snuff, shall forfeit 300*l*."

By the next clause it is provided, "That nothing hereinbefore contained shall subject any manufacturer of, dealer in, or retailer of, tobacco to the said penalty of 300*l*., or to any forfeiture for, or by reason of, his scenting or flavouring any snuffs, so that only the essential oils usually made use of for that purpose shall be used for communicating the scent or flavour."

Besides the addition of water, salts, and the several other substances discovered by us in the course of our analyses, we find that snuff is occasionally further adulterated with various vegetable matters and earthy substances. From an excise return of the seizures made during the two years 1851 and 1852, it appears that fourteen prosecutions were instituted against persons residing in various parts of the United Kingdom, for adulterating snuff with vegetable and earthy matters, or for having the materials for adulteration in their possession. It is worthy of notice, how much more extensively this fraud is practised in the provincial towns than in London, for out of the whole fourteen seizures, three only were effected in the metropolis. On an examination of this return, it appears that the following substances were either detected or seized by the excise authorities in the cases above referred to:—"Powdered Columbo root, yellow ochre, quassia, red ochre, and gentian root, in one case; peat moss and earthy matter, in two cases; earthy matter and ground rhubarb leaves, in one sample; 12·11 per cent. of oxide of iron and sand, in one case; 30 per cent. of vegetable matter not tobacco, and powdered leaves of trees, each in one case; ground fustic-wood, in two cases, one containing 25 per cent., the other 15 per cent.; in one sample wood and earthy matter was found, and in two other cases the materials used in the adulteration were not stated. In the whole of the prosecutions instituted, the parties who were proved guilty of practising the fraud were mulcted in penalties of from 50*l*. to 500*l*., or suffered imprisonment for periods of from two to three months.

But it is not only with adulteration that the revenue has to contend, but also with *smuggling*. Since 100 lbs. of tobacco-leaf yield but 20 lbs. of stalks, it is evident that the quantity of the latter produced in the manufacture of tobacco and cigars in England is not nearly sufficient to meet the enormous and increased demand for snuff, the annual consumption of which amounts to nearly 3,000,000 lbs., consequently large quantities of the stalks are annually imported from abroad; but the high price which these fetch, ranging between 2*s*. 10*d*. and 3*s*. 4*d*. per lb., led, some years since, to their being extensively smuggled, principally from Holland, which country is itself largely supplied with tobacco-stalks from the United States. The price of the smuggled article has been as low as seven farthings to three-halfpence per pound; a great inducement is thus held out for defrauding the Excise. A few years since, one of the largest tobacco manufacturers in London was convicted and fined for having in his possession a great quantity of tobacco-stalks that had not paid duty.

As we learn, from the evidence of one of the witnesses examined before a Committee of the House of Commons, in 1844, on the tobacco trade, one of the methods adopted for smuggling tobacco-stalks was by having the bottoms of large baskets in which some heavy merchandise was imported made entirely of tobacco-stalks interwoven; these bottoms were very thic
weighed as much as 75 lbs. each; as soon as the good
cleared the Custom-house, the bottoms were taken out
the baskets and contents were purposely made exe
much labour and trouble for the excise officers
the bottoms. In this way large quantities
clandestinely imported.

RTY-THREE SAMPLES OF VARIOUS SNUFFS,

bular Form.

hromate Potash.	Silica.	Ash analysed.	Total Ash per cent.	Colour of Ash.	Effervescence of Carbonic Acid Gas liberated from Cold Infusion on the addition of Hydrochloric Acid.	No. of Sample.
-	4·0	26·2	26·52	Dull rusty brown.	Slight.	1
-	5·4	29·6	30·54	Blackish-brown.	Very considerable.	2
-	8·4	30·8	30·40	Dull brown intermixed with yellow.	Traces only.	3
-	1·8	18·6	20·18	Dark yellowish-brown.	Slight.	4
-	2·8	26·8	28·02	Dull reddish-brown.	Very considerable.	5
6·2	5·0	32·6	35·54	Dark reddish-brown, intermixed with yellowish-brown.	Considerable.	6
-	1·4	26·6	26·52	Blackish-brown, fused into a mass.	Slight traces.	7
5·9	1·4	21·0	22·60	Dull yellowish-brown.	Slight.	8
-	3·2	23·8	26·34	Deep rusty brown.	Ditto.	9
-	0·6	22·8	23·66	Blackish-grey, partly fused.	Rather much.	10
-	0·8	18·0	20·00	Ditto ditto.	None.	11
-	0·8	15·8	18·26	Dark grey, partly fused.	Traces only.	12
-	0·9	28·0	29·94	Yellowish-grey, ditto.	Considerable.	13
-	0·6	28·0	28·72	Light greyish-fawn colour.	Immense.	14
-	1·0	19·2	21·20	Pale grey.	Very slight.	15
-	1·0	18·6	20·12	Grey, partly fused.	None.	16
-	0·4	17·4	19·32	Dark reddish-brown.	Slight.	17
-	2·0	21·6	23·24	Ditto ditto.	Rather much.	18
-	2·2	19·6	21·08	Light dull brown.	Ditto.	19
-	3·4	23·6	24·[illegible]2	Light ochry-fawn.	Slight.	20
-	0·6	19·2	21·24	Dirty reddish-brown.	Very considerable.	21
-	4·4	26·2	27·22	Reddish-brown.	Rather much.	22
-	8·2	28·0	28·26	Deep reddish-brown.	Slight.	23
-	2·0	22·0	22·74	Deep greyish-brown.	Very considerable.	24
-	3·4	23·6	23·52	Blackish-brown.	None.	25
3·7	2·0	20·8	21·75	Light brown.	Ditto.	26
-	2·4	22·0	24·04	Dark brown, intermixed with yellowish-brown.	Rather much.	27
-	4·6	21·0	22·28	Greyish-brown.	Very slight.	28
-	0·6	26·0	28·24	Deep umber-brown.	Immense.	29
-	3·8	21·0	22·26	Dark brownish-grey.	Very slight.	30
-	2·6	24·8	25·84	Light brownish-fawn.	Rather much.	31
-	1·6	19·6	25·52	Dark brown, nearly black.	Mere trace.	32
-	3·4	25·6	26·44	Rather light brown.	Immense.	33
-	3·8	22·0	22·92	Greyish-brown.	Considerable.	34
-	1·2	19·6	19·96	Dirty reddish-brown.	None.	35
-	3·6	20·6	23·94	Light brownish grey.	Ditto.	36
-	2·0	20·4	21·32	Dark grey, nearly black.	Slight traces.	37
-	1·8	20·2	21·26	Dull brown.	Rather much.	38
-	3·0	17·6	18·72	Dark greyish-brown.	Traces only.	39
-	1·8	20·0	22·08	Ditto ditto.	Rather much	40
-	1·6	20·8	22·64	Blackish-grey.	Very considerable.	41
-	1·6	21·6	- -	Light brown.	Slight.	42
-	5·2	30·0	- -	Light reddish-brown.	None.	43

of digestion. In persons of weak circulation and digestion, in many of whom the habit of tobacco-smoking is attended with great expectoration, there is no question but that the indulgence in this practice is in a high degree prejudicial to health, for it lowers still more the force of the circulation and the powers of digestion; while the great expectoration of saliva, a fluid which contains a large portion of animal matter, acts as an exhausting drain upon the system.

There is another class of persons on whom the practice of tobacco-smoking may possibly exert a beneficial effect—namely, those of nervous and irritable temperament—especially those who are so from the over-excitement of business, rather than from disease: this would apply to a considerable number of residents in large towns and cities.

In those cases in which smoking is attended with great expectoration, it is probable that the constitutional effects of the tobacco are experienced in a far less degree, since very much of the nicotin and nicotianin is ejected with the saliva.

In countries where tobacco is grown, as in America, the pernicious effects of extreme indulgence in smoking are fully known and recognised. In America it is no uncommon circumstance to hear of coroners' inquests on the bodies of smokers, especially youths, the ordinary verdict being, "Died from excessive tobacco-smoking."

But a very large proportion of tobacco-smokers belong to none of the three classes of persons above referred to, being neither plethoric, dyspeptic, nor nervous and irritable, but are in the enjoyment of a good and sound state of health: to such persons we would say that the habit of tobacco-smoking is useless and expensive, and simply panders to that spirit of self-indulgence which leads many to gratify the senses in a variety of ways.

The habit of smoking is often injurious in an indirect manner, by its acting as an inducement to drinking, and thus becoming the source of intemperance and its attendant evils. Indeed, too frequently these practices go together. "Smoking induces drinking, drinking jaundice, and jaundice death."

Many of the above remarks apply with greater force to the practice of tobacco-chewing; in this case, no doubt, a larger quantity of the active principles of the tobacco make their way into the system; and this amount would be very much greater were it not for the fact that all chewers of tobacco expectorate largely and often injure themselves thereby.

The constitutional effects resulting from the use of tobacco in the form of snuff, when this is genuine, are certainly much less than in the case either of smoking or chewing tobacco; indeed, the effects are in most cases chiefly local. The nerves of the Schneiderian membrane are over stimulated; there is determination of blood to the part, and the membrane becomes thickened and insensible; at the same time the brain is roused to increased action. When any of the snuff taken makes its way into the fauces, as it very often does, it produces a certain amount of constitutional derangement, and often gives rise to dyspepsia. On first beginning to take snuff, sickness and faintness are induced in the same way as from tobacco-smoking.

The chief local effects of the long-continued use of snuff are, impairment of the sense of smell, and to a less extent of that of taste; the voice also becomes much altered. These effects are not to be attributed entirely to the tobacco contained in the snuff, but are also due to the irritating action of the alkalies and salts which enter into the composition of all snuff, as well as to the red and yellow ochre, red lead, chromate of lead, bichromate of potash, and many other injurious substances with which snuff is coloured. The poisonous nature of the chromates of potash, especially the bichromate, has long been suspected from the distressing symptoms produced in workmen engaged in many of the operations of dyeing. This led Mons. Duchatel, of Paris, to institute experiments with the view to investigate and determine the effects which this salt exerts on the animal economy, and the doses in which it proves injurious or poisonous. He found that, even in the small doses of from one twenty-fifth of a grain to hundredth of a grain, it destroyed the lives of animals (dogs) o experimented, causing sickness, vomiting, and severe gastritis; and examination showed the mucous membrane of the stomach and much inflamed and completely softened.

Chromate of lead and red lead, although not poisonous to are yet of a very deleterious nature, even in exceeding min esides tobacco-stalks large quantities of foreign manufactured snuffs have at different times found their way into the British market by means of ggling, some of the devices for the successful accomplishment of which are ingenious. In the report of the Select Committee of the House of Com-s on the tobacco trade, already referred to, it is stated by one of the esses, that in 1843, no less than 20,000 lbs. of snuff were smuggled from land, made up into the shape of Dutch cheeses, and passed through the tom House as such without being detected. The duty on this kind of snuff ver 6*s.* per lb.; it will be seen, then, that by this one transaction Government defrauded to the extent of 6000*l.*

PROPERTIES AND EFFECTS OF TOBACCO.

Ve will in the next place consider the effects of the use of tobacco upon the man frame, whether smoked, chewed, or employed in the form of snuff.

obacco owes its chief properties to the presence of two active principles, ned *nicotina* and *nicotianin*. The first of these, *nicotina*, is thus characterised: s liquid and volatile, devoid of colour, with an acrid, burning taste, and sesses the strong odour of tobacco; to test-paper it shows an alkaline re-on; water, ether, alcohol, and the oils dissolve it. It combines with various anic and inorganic acids to form salts. 1000 grains of tobacco yield, according he kind used, from 3·86 to 11·28 grains of nicotina. The action of nicotina he human frame is that of an acrid, narcotic poison, causing giddiness and iting, and in doses of a few grains, death.

he properties of the latter, *nicotianin*, are as follow: — It is a concrete oily stance, having the smell of tobacco, and a bitter taste. It is volatile; the te acids and water do not dissolve it, but it is soluble in liquor potassæ and r. In swallowing nicotianin, the same sensation is produced on the tongue fauces as by tobacco. A grain administered internally, quickly caused iness, nausea, and retching. It also produces sneezing when applied to the . Six pounds of tobacco leaves furnish about eleven grains of nicotianin, also known as "*Concrete Oil of Tobacco,*" and "*Tobacco-Camphor.*"

oth these active principles and constituents have been shown by chemical ysis to be present in the smoke of tobacco; they are therefore undoubtedly destroyed by the combustion of the tobacco, whether used in the form of obacco or cigars, but in the act of smoking they are inhaled and thus drawn the mouth, fauces, lungs, and even the stomach, especially when the saliva, egnated with the tobacco-smoke, is swallowed. Further, that these active tituents are actually absorbed, and make their way into the system, is ed, from the sickness, giddiness, and death-like faintness, experienced by who are unaccustomed to smoking; that they are absorbed to some degree ot to the same extent, in the case of habitual smokers of tobacco is estionable, the difference in the effects experienced being due to the cir-stance of the system becoming more inured to its use, and therefore less ptible of its influence.

the case of confirmed smokers, the effect of tobacco-smoke is that of a otic. After a very short and almost inappreciable period of excitement, ffect begins, and its tranquillising influence is experienced, pervading the e system; the frequency and force of the pulse are diminished, as well as onicity of the muscles, particularly of the involuntary muscles, as is shown he readiness with which the bowels act in most cases after smoking tobacco. action of the skin is also often increased, but there is no evidence to whether it exerts any sensible effect over other secretions, as those of liver and kidneys. Bearing in mind the nature of the ordinary and more al symptoms above referred to, produced by the smoking of tobacco, we are position to appreciate the effects of the continued use of tobacco in this n upon the human system.

persons whose circulation is brisk, and who have an abundance of red d—in other words, in the sanguine and the plethoric — in whom the functions gestion and assimilation are active, we should say that this habit would be lated to be productive of beneficial rather than injurious consequences, by ring somewhat the tone of the circulation, and by promoting the secretion e salivary glands and of the *skin*; also, perhaps, by moderating the activity

RESULTS OF THE MICROSCOPICAL, CHEMICAL, AND GENERAL EXAMINATION of TWENTY-EIGHT SAMPLES OF ANCHOVIES, PURCHASED OF OILMEN, GROCERS AND BOTTLERS OF THIS FISH, RESIDENT IN THE METROPOLIS.

1*st Sample.*—Purchased of G. Whybrow, 4. Minories. In diamond-shaped bottle. Price 1*s.*

Consisting entirely of DUTCH FISH; the fish, as well as the brine, being intensely coloured with an immense quantity of a ferruginous earth, resembling *Venetian red*, or *reddle*.

2*nd Sample.*—Purchased of Batty & Feist, 102. Leadenhall-street. In square bottle. Price 1*s.* 6*d.*

Fish and brine deeply coloured with a considerable quantity of red ferruginous earth, resembling *Venetian red.*

3*rd Sample.*—Purchased of C. Wix & Son, 22. Leadenhall-street. In Price 1*s.* 6*d.*

Brine of a brownish colour, and does not contain *Venetian red, bole Armenian*, or any other red ferruginous earth.

4*th Sample.*—Purchased of T. Snelling, 30. Fenchurch-street. In square bottle. Price 1*s.*

Fish, as well as the brine, highly coloured with a large quantity of red earth resembling *Venetian red*, which falls to the bottom as a copious precipitate.

5*th Sample.*—Purchased of E. Fenning, 5. Poultry. In glass barrel. Price 1*s.* 6*d.*

Brine rendered thick with *wheat-flour*, and slightly coloured with a red earth, resembling *bole Armenian.*

6*th Sample.*—Purchased of J. Wingrave, 90. St. Paul's Churchyard. In square bottle. Price 1*s.* 3*d.*

Brine of a deep brown colour, from admixture with a large quantity of earth, resembling *bole Armenian.*

7*th Sample.*—Purchased of J. Burgess & Son, 107. Strand. In square bottle. Price 1*s.* 6*d.*

Brine decidedly coloured with a red earth, resembling *Venetian red.*

8*th Sample.*—Purchased of J. Prosser, 202. Fleet-street. In diamond-shaped bottle. Price 1*s.*

Fish *mixed*, consisting in part of DUTCH FISH; the brine being highly coloured with a considerable quantity of red earth, probably *Venetian red.*

9*th Sample.*—Purchased of Phythian, 430. West Strand. In bottle having upon it the label of Messrs. Crosse & Blackwell. Price 1*s.* 3*d.*

Brine decidedly coloured with red earth, probably *bole Armenian.*

10*th Sample.*—Purchased of J. E. Imbrie, Strand. In square bottle. Price 1s.

Consisting entirely of DUTCH FISH; the brine being vividly coloured with an immense quantity of a bright red earth, like *Venetian red*, which falls to the bottom, forming a copious precipitate.

11*th Sample.*—Purchased of J. Weston, 26. Hungerford-market. In diamond-shaped bottle. Price 1*s.*

The fish and the brine intensely coloured with an enormous quantity of a reddish-brown earth, resembling *bole Armenian;* drachms of the earth might be obtained from this bottle.

12*th Sample.*—Purchased of Trowell & Co., 93. St. Martin's-lane. In small glass barrel. Price 6*d.*

Fish and brine very highly coloured with a large quantity of a reddish earth, resembing *bole Armenian;* about a third of the contents of this barrel is made up of *rock salt, scales, and broken fragments of fish.*

13*th Sample.*—Purchased of J. Scott, 18. Coventry-street. In square bottle. Price 1*s.*

Fish *mixed*, consisting in part of DUTCH FISH, highly coloured with bole *Armenian.*

14*th Sample.*—Purchased of J. Quinn, 40. Haymarket. In square bottle. Price 1*s.* 6*d.*

Brine decidedly coloured with a red earth; resembling *Venetian red*, which is visible as a sediment at the bottom of the vessel. Nearly a third of the contents of this consisted of *bay salt*, scales, and broken fragments of fish.

llic salts are constantly employed to give colour to variety of articles,
cially sugar confectionery; and many instances have been recorded of the
consequences to children who have partaken of sweets in which these dan-
us substances had been used.

e quantity of chromate of lead and red lead contained in snuff as shown by
analyses is often very considerable, nearly 5 per cent. being sometimes
d in it; sufficient, as appears from the following very interesting and
y important case, for the particulars of which we are indebted to Professor
sen, to give rise to the different symptoms and effects of poisoning by
, as cholic, paralysis, &c.

Case of Slow Poisoning by Snuff containing Lead, by Mr. Erichsen.

hilst on a professional visit in the country last March, I was requested to
a gentleman who had been invited down to a friend's country seat in the
that change of scene and air would influence favourably an attack of
lysis, which was said to be of a rheumatic character; by which he had
disabled from work for many months past, and of which he despaired of
vering, having relinquished all treatment.

found the patient in bed, and somewhat exhausted by the journey down—a
ance of nearly a hundred miles from his usual residence. He was peculiarly
w, the complexion having almost an icteric tinge; but the countenance
lively and expressive, and the intellect as bright as usual.

r. A. B. could stand and, if supported, could walk, though feebly and with
h difficulty. He complained much of pains about the shoulders and the
y parts of the thighs and legs, and especially of burning sensations in the
of his feet. The articulations all appeared healthy, no swelling or
ness was perceptible about any of them.

was, however, particularly struck with the appearance of the hands and
, which were lying powerless on the coverlid of the bed. There was
ked "wrist-drop" of both arms, the hands hanging flaccid and at right
es with the forearms, without the patient being able to extend or raise
in the slightest degree. There was, however, some slight power of
sion left in the fingers, especially in those of the left hand. Though
le to extend the fingers, raise the hand, and scarcely having power to
te the arm, Mr. A. B. could *flex* the fingers pretty firmly so as to give a
ably good grasp to whatever was put into his hand. The index finger of
ight hand seemed to be the most affected and was permanently flexed.

ere was a very marked degree of wasting of the whole mass of the
sor muscles of the forearm, so that a longitudinal hollow corresponding
e interosseous space was perceptible down the whole length of the forearm,
very deep and marked depression in the interspace between the first and
d metacarpal bones. The hands were quite powerless, and the patient
nable to render himself the slightest assistance.

e tongue was pale and flabby; and on examining the gums I found a deep blue-
or leaden-coloured line around the teeth, more marked about the molars.
gestion was much impaired. Appetite capricious, with much flatulence
ccasional attacks of constipation with colicky pains.

inquiring into the history of the case, I learnt that Mr. A. B., who is
h devoted to literary pursuits and habitually led a sedentary life, had for
years previously suffered from pains of a rheumatic or gouty character;
in May, 1853, he had been attacked by constipation and colic whilst lodging
short time in a newly painted house. In August of the same year he had
begun to lose power in extending his arms, finding a difficulty in raising
to put on his coat; and from this time the paralytic symptoms gradually
ased until they had assumed the degree in which I found them, when he
become reduced to a state of complete physical helplessness, though, as I
already observed, his powerful and clear intellect was as perfect as ever.

examining Mr. A. B. I was at once struck by the very marked "wrist-
," more complete than I had ever seen before; the limitation of the
lysis to the extensors, which were greatly wasted; the existence of a blue
around the teeth; and the occurrence of occasional attacks of constipation
colic, together with fl*ying pains in the* fleshy parts of the body, with absence

MESSRS. HILLS & UNDERWOOD,
Vinegar Makers,
Norwich.

Does not contain free sulphuric acid. 1000 grains yield 56·66 grains of *acid*, or 5·66 *per cent.*, and 0·38 of *combined sulphuric acid.*

14*th Sample.*—Purchased of J. Leigh, 122. Whitechapel-road. Sold vinegar of

MESSRS. HILL, EVANS, & CO.,
Vinegar Makers,
Worcester.

Does not contain free sulphuric acid. 1000 grains yield 51·84 grains of *acid*, or 5·18 *per cent.*, and *combined sulphuric acid*, as stated below.

15*th Sample.*—Purchased of J. Swinge, 3. Arbour-terrace, Commercial East. Sold as the vinegar of

MESSRS. HILL, EVANS, & CO.,
Vinegar Makers,
Worcester.

Does not contain free sulphuric acid. 1000 grains yield 33·57 grains of *acid*, or 3·35 *per cent.*, and *combined sulphuric acid*, as stated below.

16*th Sample.*—Purchased of C. Batty, Grand Junction-terrace, Edgware- Sold as the vinegar of

MESSRS. HILL, EVANS, & CO.,
Vinegar Makers,
Worcester.

Does not contain free sulphuric acid. 1000 grains yield 49·24 grains of *acid*, or 4·92 *per cent.*, and *combined sulphuric acid*, as stated below.

The vinegars of Messrs Hill, Evans, & Co. have been recently analys Professors Graham, Hofmann, and Playfair. The quantity of *combined* sulp acid given in their analyses ranged from 1·23 to 1·33: this is derived fro grain and well-water used, but principally from the latter, which contains siderable quantity of sulphate of lime, in which respect it is like the B water, only that the quantity of lime is greater.

17*th Sample.*—Purchased of Messrs. Smith and Tyers, Vinegar Merchant High-street, Borough. Sold as the vinegar of

Mr. J. P. OSBORNE,
Vinegar Maker,
Colchester.

Contains *a very considerable quantity of sulphuric acid.* 1000 grains 44·77 grains of *acetic acid*, or 4·47 *per cent.*, and 2·41 of *sulphuric ac*

18*th Sample.*—Purchased of W. Fontaine, 10. Vere-street, Clare-m Sold as

COUNTRY VINEGAR.

Contains *an immense quantity of sulphuric acid.* 1000 grains yield grains of *acetic acid*, 3·51 *per cent.*, and 3·65 of *sulphuric acid.*

From inquiries made, we believe that this vinegar, as also that of th succeeding samples, were made by Mr. Osborne, of Colchester.

19*th Sample.*—Purchased of W. Fontaine, 55. High-street, White Sold as

COUNTRY VINEGAR.

Contains *a very considerable quantity of sulphuric acid.* 1000 grains 52·33 grains of *acetic acid*, or 5·23 *per cent.*, and 2·60 of *sulphuric a*

Castor oil with laudanum, in large doses, and the use of injections of
tine, at last gave relief to them. I was then for some time tormented by
pain in the small of the back, and extending to the lower extremities,
possibly by the action of the turpentine on the kidneys. Dr. T. saw me
time, when paralysis of the upper extremities had gone on so far that
unable to turn in bed. He most kindly interested himself in my case, and
ted a most minute inquiry as to what I took different from my family,
once fixed on the article of snuff as the probable source from which the
had been impregnated. Subsequent investigation fully confirmed his
My health is now perfectly restored, nothing remaining but a trifling
ess of the extensors of the fingers.
he treatment, in the first instance, was sulphuric acid and alkaline sul-
. Iodide of potassium produced no very marked benefit until galvanism
onjointly tried with it, under which plan I was in a few months fully
d to health."

he letter which accompanied the sketch of the case above given, Mr. Fos-
remarks: —

rhaps it may be interesting in some degree, in addition to what I stated
ting myself, if I inform you that my father, who is now between 70 and
rs of age, took the same snuff, and has been incurably paralysed for many
past. No opinion was given by any medical man he consulted as to its
He had discontinued the use of snuff for several years previous to my
curring, and has now much better health, with exception of the powerless
ion of the arms."

second communication, Mr. Fosbroke furnishes the following further in-
ion: "I forgot to say, respecting my father's case, that about four years
e suffered most dreadfully from sciatica, which confined him to bed for
l months, and that Dr. Thomson then visited him, and pointed out that
d occasioned all the mischief, but that from its insidious introduction into
stem from whatever source, and the length of time that had elapsed, little
be done beyond relieving his present sufferings, which fortunately was
d by sulphuric acid. From distaste he gave up snuff-taking, and has had
urn of a similar attack.
gentleman in this neighbourhood took the same snuff (Bolongaro, from
's, London), and complained of inability to raise the left arm for some
revious to his death."
ample of the snuff taken by Mr. Fosbroke yielded on analysis distinct
ces of the presence of lead, but not in amount nearly so great as the pre-
and many other of the snuffs examined.
ther case was referred, about a year since, to Dr. Letheby; it was that of
tleman who presented all the symptoms of lead-poisoning. An analysis
snuff, brown rappee, which he took, led to the discovery of the source of
ison.
the last meeting of the British Association, it was stated, in a discussion
soning by snuff, that many persons had been injured by the lead received
he system through the snuff taken. We have thus, in the case of snuff,
er striking example of injury to the public health arising out of the prac-
f adulteration.
the practices of smoking and chewing tobacco, and of snuff-taking, are
ionable on other grounds than those relating to health. The dwelling and
s of the smoker are impregnated with the heavy nauseating odour of the
o, particularly offensive to those who have a nice sense of smell, and who
t themselves tobacco-smokers. Indeed, the moral and domestic objections
king are of the strongest kind.
he case of the chewing of tobacco the practice is rendered disgusting by the
unnatural, and disfiguring stain which an indulgence in this habit imparts
teeth, and by the character of the liquid which is constantly ejected.
ff-taking is an equally dirty habit; for not only are the nostrils constantly
with the brown and earthy-looking powder, but the fauces as well as the
ch come in for their share of it; the face is often smeared with it, the nails
with it, and the shirt and *clothes also* stained and dirtied by its use.
er views *which may be taken of* these practices are, the expense and loss

27th Sample.—Purchased of Mr. Portch, 3. Silver-street, Notting-hill. Sold as the vinegar of

MESSRS. WILKINSON & SMETHURST,

VINEGAR MERCHANTS, NAG'S HEAD-BUILDINGS, BOROUGH.

Does not contain sulphuric acid. 1000 grains yield 47·70 grains of *acetic acid*, or 4·77 *per cent.*, and ·42 of *combined sulphuric acid.*

From information received, we believe that this vinegar, as also that of the succeeding sample, were made by Messrs. SWANN & Co., Stourport.

28th Sample.—Purchased of Warton & Co., 13. North Audley-street, Grosvenor-square. Sold as the vinegar of

MESSRS. WILKINSON & SMETHURST,

VINEGAR MERCHANTS, NAG'S HEAD-BUILDINGS, BOROUGH.

Does not contain sulphuric acid. 1000 grains yield 45·87 grains of *acetic acid*, or 4·58 *per cent.*, and ·56 of *combined sulphuric acid.*

The results contained in the above analyses will be more fully comprehended as arranged in the three following tables.

TABLE I.

Table showing the Results of the Analysis of Twenty-eight Samples of Vinegar.

No.	Retailers.	Makers.	Dried Carbonate of Soda required to Neutralise 1000 Grains.	Pure Acetic Acid in 1000 Grains.	Acetic Acid, per cent.	Monohydrated Sulphuric Acid or Vitriol in 1000 Grains.
1	J. Owtram.	R. Burnett & Co.	58·00	54·46	5·44	Considerable - 1·44
2	J. C. Holden.	R. Burnett & Co.	54·00	50·50	5·05	Considerable - 1·54
3	W. Fontaine.	R. Burnett & Co.	55·30	51·84	5·18	Considerable - 1·60
4	E. Chappell.	Beaufoy & Co.	40·60	35·13	3·51	An immense quantity - 4·00
5	J. Christmas.	Beaufoy & Co.	45·80	40·12	4·01	An immense quantity - 4·02
6	R. & C. Faulkner.	Potts & Co.	50·80	48 33	4·83	A very small quantity - ·63
7	T. Wood.	Potts & Co.	50·80	48·33	4·83	A very small quantity - ·63
8	E. Price.	Grimble & Podmore.	45·50	41·99	4·19	Very considerable - 1·86
9	S. Hardstaffe.	Grimble & Podmore.	34·50	27 63	2·76	An immense quantity - 4·12
10	G. Mills.	Champion & Co.	43·00	39·40	3·94	Very considerable - 2·04
11	W. Hudson.	Champion & Co.	47 00	43·29	4·32	Very considerable - 2·00
12	F. Tuck.	Hills & Underwood.	58·50	56·38	5·63	None.
13	J. Hopkinson.	Hills & Underwood.	58·80	56·66	5·66	None.
14	J. Leigh.	Hill, Evans, & Co.	56·00	51·84	5·18	None.
15	J. Swinge.	Hill, Evans, & Co.	37·50	33·57	3·35	None.
16	C. Batty.	Hill, Evans, & Co.	54·00	49·24	4·92	None.
17	Smith & Tyers.	J. P. Osborne.	49·00	44·77	4·47	Very considerable. - 2·41
18	W. Fontaine.	J. P. Osborne.	40·30	35·19	3·51	An immense quantity - 2·65
19	W. Fontaine.	J. P. Osborne.	57·00	52·33	5·23	Very considerable - 2·60
20	W. Hughes.	J. P. Osborne.	53·50	44·13	4·41	Most of all - 6·03
21	J. Holmes.	Panter & Co.	38·50	34·40	3·44	Very considerable - 2·60
22	F. Duckett.	Panter & Co.	42·50	38 65	3·86	Very considerable - 2·21
23	Mr. Moore.	Taylor & Co.	44·10	40·60	4 06	Very considerable - 1·90
24	Mr. Messent.	Taylor & Co.	56·00	51·56	5·15	Very considerable - 2·25
25	G. Pike.	Payne & Slee.	40·00	32·74	3·27	An enormous quantity - 5·15
26	W. Ingram.	Payne & Slee.	52·50	46·72	4·67	An immense quantity - 3·88
27	Mr. Portch.	Swann & Co.	49·50	47·70	4·77	None.
28	Warton & Co.	Swann & Co.	47·60	45·87	4·58	None.

From the quantities of sulphuric acid given in the following table a small deduction should be made for that portion which exists in a state of combination, and which is derived from the ingredients from which the vinegar is prepared. The quantity of combined acid varies considerably in different samples; we have found it to range between ·44 and ·39 in 1000 grains, except in the case of Messrs. Hill, Evans, & Co.

often sophisticated. The adulterating ingredient is usually pipe-clay, of which a liberal portion is substituted for sugar. The following detection of this fraud was lately made by Dr. T. Lloyd.

"'Some ginger lozenges having lately fallen into my hands, I was not a little surprised to observe accidentally that when thrown into a coal-fire they suffered but little change. If one of the lozenges were laid on a shovel, previously made red-hot, it speedily took fire; but instead of burning with a blaze, and becoming converted into charcoal, it took fire, and burnt with a feeble flame for scarcely half a minute, and there remained behind a stony, hard substance, retaining the form of the lozenge. This unexpected result led me to examine these lozenges, which were bought at a respectable chemist's shop in the City; and I soon became convinced that in the preparation of them a considerable quantity of common pipe-clay had been substituted for sugar. On making a complaint about this fraud at the shop where the article was sold, I was informed that there were two kinds of ginger lozenges kept for sale, the one at threepence the ounce, and the other at sixpence per ounce, and that the article furnished to me by mistake was the cheaper commodity: the latter were distinguished by the epithet *verum*, they being composed of sugar and ginger only; but the former were manufactured partly of white Cornish clay, with a portion of sugar only, with ginger and Guinea pepper. I was likewise informed, that of Tolu lozenges, peppermint lozenges, and ginger pearls, two kinds were kept; that the *reduced* articles, as they were called, were manufactured for those very clever persons in their own conceit who are fond of haggling, and insist on buying better bargains than other people, shutting their eyes to the defects of an article, so that they can enjoy the delight of getting it cheap; and secondly, for those persons who, being but bad paymasters, yet, as the manufacturer, for his own credit's sake, cannot charge more than the usual price of the articles, he thinks himself therefore authorised to adulterate it in value, to make up for the risk he runs and the long credit he gives.'—*Literary Gazette*, No. 146.

"The comfits called ginger-pearls are frequently adulterated with clay."

Under the head of "Lozenges and their Adulteration," Mr. Mitchell observes:—

"There are few substances so subject to adulteration as lozenges and similar preparations consumed by children; not only are substances added to them which are cheaper than the sugar in their composition, but others also of a very deleterious character, as preparations of lead, arsenic, copper, &c., for the purpose of colouring.

"The substances employed in the adulteration in bulk are chalk, pipe-clay, plaster of Paris, sand, and starch, all of which bodies can be readily detected and are very often present in such lozenges as are sold in small quantities, and are therefore consumed by children, occasioning severe constipations, and all the diseases arising from such a source; indeed there is little doubt that many children are thus annually sacrificed."

And again, at page 209., Mr. Mitchell continues:—

"I may here add, that all the cheap lozenges I have examined contain starch, and, very nearly all, chalk and plaster of Paris; only a few contain sand, such being a very palpable adulteration. The quantity of chalk and plaster of Paris varied from one to twelve per cent.

"I now have to treat of a far more dangerous adulteration: I allude to the colouring matters used in the manufacture of lozenges, &c., the papers also in which some of these substances are wrapped have also a great tendency to communicate a poisonous character, on account of the presence of salts of arsenic, copper, &c.

"In addition to my own experiments, I shall give the greater portion of a paper on this subject by Dr. O'Shaughnessy, which appeared in the second volume of The Lancet, 1830-31; and I must also state that I can fully confirm that gentleman's experiments as to the various 'substances used in this most infamous manufacture.'

"Dr. O'Shaughnessy," writes Mr. Mitchell, at page 213., "purchased various

1st. That *seven* of the samples were entirely free from sulphuric acid, or of vitriol.

2nd. That *eighteen* were adulterated with that powerful and corro mineral acid, the amount of which was variable, and often very considerabl from ·63, the lowest, to 6·02, the highest quantity in 1000 grains.

3rd. That *two* of the samples contained it in very small quantity only.

4th. That in *three* samples it was present in considerable amount.

5th. That *six* contained it in very considerable amount.

6th. That in *seven* samples it was present in immense quantity.

7th. That the acetic acid also varied very considerably in amount in differ samples, the highest proportion being, in 1000 grains by measure, 5 grains, or 5·66 per cent., and the lowest, 27·63, or only 2·76 per cent.

8th. That in *eight* samples, the acetic acid was present in amount over fi per cent., which is above the standard strength.

9th. That in *twelve* samples the quantity exceeded *four* per cent.

10th. That in *seven* it was over *three* per cent.

11th. That in *one* the quantity of acetic acid present was so exceedingly small a to be *under three* per cent.,—that is, but little more than half the proper streng

12th. That the vinegars which were ascertained to be *free* from sulphur acid or oil of vitriol were those of the following makers:—

MESSRS. HILL, EVANS, AND CO.,
WORCESTER.

MESSRS. HILLS AND UNDERWOOD,
NORWICH.

MESSRS. SWANN AND CO.,
STOURPORT.

The London agents for this vinegar are—

MESSRS. WILKINSON AND SMETHURST,
NAG'S HEAD BUILDINGS,
BOROUGH.

Here also ought to be mentioned the firm of

MESSRS. POTTS AND CO.,
BRIDGE-STREET, SOUTHWARK,

since the amount of sulphuric acid detected in the samples of their vinegar submitted to examination was so exceedingly small, that they might be considered nearly free from that acid.

To the names of the above makers who do not use sulphuric acid in the manufacture of their vinegars, we may add those referred to in a previous report, of

MESSRS. KENT AND SONS,
UPTON-ON-SEVERN.

The fact of the vinegars of these different makers being found to be entirely free from sulphuric acid, we regard as most important, since it proves mo convincingly that the use of that highly objectionable acid, even in small quantities, is not necessary to ensure the preservation of vinegar, and shows that its addition is made rather for the purpose of increasing its apparent strength.*

Families may manufacture for themselves, by a simple process, the whole of the vinegar they require either for the table or for the purpose of pickling, and so make themselves independent of the vinegar-maker, and insure the purity of the article, and its freedom from oil of vitriol.

Sugar or treacle contains the elements out of which, under a new arrangement, vinegar may be formed, the only thing necessary to the change being the addition of a suitable ferment. This is found in the form of a fungus, whi under the name of the *vinegar-plant*, has been employed in different part the country for inducing the requisite fermentation.

We were favoured, some months ago, with the following particulars in re ence to the vinegar-plant, by Mr. Fletcher, surgeon, Bromsgrove:—

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* In page 372, it is stated that an improvement in the manufacture of Malt Vinegar was invente *Mr. Ham of Norwich*; this is erroneous, as the inventor and patentee of the improvement was the lat *John Ham of Bristol*.

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" I have been told," writes Mr. Mitchell, " by many parties, that h
profits are made annually by the manufacture of a spurious anchovy f
common sprat; and not only is
confined to those who sell the
even private families deceive th
into the idea that 'anchovy' s
at least as good as the real fish;
cases, they are as good as the
as anchovies, which, indeed, are
but prepared sprats. This is, l
easily detected, for the appea
the two fish is very different. A
tive examination of the form of
chovy and the sprat will suffice
out the distinguishing characte
each, in such a marked manner
fraud is very apparent.

According to M'Culloch, "
dine, a fish which is flatter an
than the anchovy, is frequentl
tuted for it."

Before proceeding to give th
of the examination and ana
various samples of anchovies, a
in the metropolis, we insert an
figure, as also a scientific descri
the fish, taken from Yarrell's
work on the British Fishes.

" *Generic Characters.*—Disti
from the herring in having
pointed: the upper jaw the long
mouth deeply divided; the op
tending backwards behind th
the eyes; the gape branchial
very large; the ventral fins in
of the line of the commenceme
dorsal; abdomen smooth; b
tegous rays twelve.

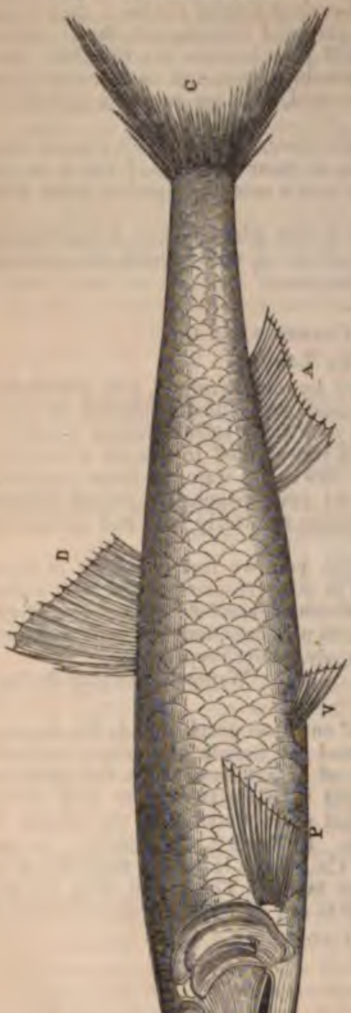
" I have followed Dr. Fle
preserving to the anchovy the
by which it was formerly know
called *Lycostomus*, from the fo
mouth; and *Engraulis encrasi*
cause, from its bitterness, it
posed to carry its gall in its he
this reason, the head, as we
entrails, are removed when t
pickled.

" The anchovy is a commo
the Mediterranean, from Greec
raltar, and was well known to th
and Romans, by whom the liq
pared from it, called *garum*, wa
estimation. Its eastern range is
into the Black Sea.

" The fishing for them is c
during the night, and lights
with the nets.

" The anchovy is commo
coasts of Portugal, Spain, and
it occurs, I have no doubt, at t
nel Islands, and has been taken on the Hampshire coast, and in t

Fig. 144.
THE TRUE ANCHOVY.
Engraulis encrasicolus, FLEMING.



D, dorsal fin; P, pectoral fin; V, ventral fin; A, anal fin; C, caudal fin.

by their colour being fixed in the fire, so that the ash of sugar articles coloured with any of these substances is of a bright blue, the tint varying according to the blue used, as well as also in consequence of admixture with uncoloured substances, such as chalk, lime, or pipe-clay. These colours are somewhat expensive, especially the true ultramarine, but they are of such intensity that a little goes a great way; there is, however, a cheap kind of ultramarine, sold in the shops as German or French ultramarine, the price being about sixpence per ounce, and it is this blue pigment which is chiefly employed in the colouring of sugar confectionery. This may be distinguished, when free from admixture with other substances, by adding to it a little hydrochloric acid, and observing the odour of sulphuretted hydrogen or rotten eggs evolved. This method of discrimination is, in the case of coloured sugar confectionery, for the most part inapplicable, since sulphuretted hydrogen is almost invariably thrown off whenever hydrochloric acid is added to the ash left on the incineration of most articles of sugar confectionery.

Of the *greens*, there is but one *vegetable* green used — namely, *sap-green*. This is prepared from the green berries of the buckthorn, *Rhamnus catharticus;* but its use is to be objected to on account of its frequent adulteration with green metallic pigments, containing either copper or arsenic, in order to heighten its colour and render it more permanent.

Of the *metallic greens*, some are simple colours, while others are composed of a blue and a yellow mixed. The *simple greens* are *acetate of copper* or *verdigris*, and *arsenite of copper*, *emerald green* or *Scheele's green*. The first of these colours is known by its containing copper, and its being entirely dissipated by heat, and the latter by its containing both copper and arsenic. The arsenic can be readily obtained in a crystalline state by subliming a minute portion of the colouring matter in a small glass tube open at both ends, and this test is quite conclusive as to the nature of this pigment.

The *compound greens* ordinarily used are those commonly sold as *Brunswick greens;* they are the colours usually employed in making green paint, and are of three different tints, known as pale, middle, and deep Brunswick. They consist of a mixture, in various proportions, of usually *Antwerp blue*, but sometimes *ultramarine*, and *pale chromate of lead*. Where obtained in any quantity from the confectionery, and diffused through water in a shallow dish, the two colours easily separate. Other compound greens are occasionally made by mixing a yellow pigment, usually the *pale chrome*, with one or other of the verditers. The true Brunswick greens are *oxi-chlorides of copper*, but these being very expensive, are seldom employed.

The *browns* which we have met with consist of *Vandyke brown* and *burnt umber;* these are both *ferruginous earths*.

The *purple colour* sometimes met with in sugar confectionery is usually composed of a mixture of *Antwerp blue* and some *vegetable pink*, as *rose-pink*, the *lakes*, or *cochineal*.

In addition to the various pigments above-mentioned, *bronze powders*, which consist of an alloy of copper and zinc, are sometimes employed in ornamenting sugar confectionery.

But like most other articles of consumption sugar confectionery is liable to further adulteration by admixture with a variety of substances cheaper than the sugar, of which they ought entirely to be formed. Although our attention has been directed principally to the detection of the colouring matters employed, we have yet not overlooked the general adulterations to which articles of sugar confectionery are subject.

The principal substances said to be used are various kinds of *starch*, *chalk*, *sulphate of lime* or *plaster of Paris*, *hydrated sulphate of lime* or *gypsum*, and *white potter's clay*, *pipe-clay*, or *Cornish clay*.

Ordinary plaster of Paris, although stated to be employed in the manufacture confectionery intended to be eaten, can scarcely ever be so, since when this moistened with water it quickly becomes solid, retaining its solid state after ration; on the other hand, hydrated sulphate of lime does not remain when exposed to a red heat, it is still a powder.

sufficiently identified by its appearance, by its effervescing on the acid, and by the lime being thrown down from its solution by monia.

The *gypsum* must be tested both for sulphuric acid and for lime, and the clay for alumina.

The kind of *starch* employed is detected by means of the microscope, and the quantity may be estimated in either of the following ways: — When starch only is mixed with the sugar the latter may be dissolved out, and the precipitated starch dried and weighed; but when any other insoluble substance is present the precipitate left after the removal of sugar may be burned, and the loss of weight will give very nearly the quantity of starch present; or the precipitate may be boiled in water. The starch will be taken up, and the insoluble matter will subside, the supernatant liquid can then be decanted from the deposit, and the starch precipitated in the form of an iodide.

Results of the Chemical and Microscopical Examination of nearly One Hundred Samples of Different Kinds of

COLOURED SUGAR CONFECTIONERY.

Comfits of Various Kinds.

1st Sample. — Purchased of J. Lussenden, 64. Broad-street, Bloomsbury.

The comfits in this parcel are coloured *deep pink* and *yellow*, intermixed with *white* or uncoloured comfits. The colouring matters used are, for the pink, a *non-metallic* or *organic red pigment*, most probably a solution of *cochineal;* and for the yellow, CHROMATE OF LEAD OF CHROME YELLOW. These comfits also furnished 43·66 per cent. of *ash*.

2nd Sample. — Purchased of A. W. Hearn, 56. Tottenham-court-road.

The comfits in this sample are all of a *pale pink* colour, the pigment used being a *non-metallic red colouring matter*. *Ash*, 1·72 per cent.

Coriander Comfits.

3rd Sample. — Purchased of R. Kilner, 4. Hanway-street, Oxford-street.

These comfits are all of a *deep pink*. The colour, which consists of a non-metallic red pigment, most probably *cochineal*.

White Caraway Comfits.

4th Sample. — Purchased of S. Clark, 117. Bishopsgate-street Without.

These comfits consisted externally of sugar, and internally of a large nucleus made up of *wheat-flour* enclosing the seed. The flour, when thoroughly dried, amounted to 8·90 per cent. Ash, 1·60 per cent.

Some ingenuity in deception was displayed in the manufacture of these comfits, for when placed in the mouth they were quite sweet to the taste at first, but after the external coating of sugar had been dissolved, there remained behind the hard and tasteless nucleus of considerable size.

Large Oval Comfits.

5th Sample. — Purchased of J. Lussenden, 64. Broad-street, Bloomsbury.

The comfits in this parcel were coloured *pink* and *yellow*, intermixed with a few *white* or uncoloured ones. The colouring ingredients used for the pink pigment are a *non*-metallic red, probably *cochineal*; and for the yellow, CHROMATE OF LEAD, the latter in rather large amount. *Ash* very inconsiderable.

Red Burnt Almonds.

6th Sample. — Purchased of J. Cooper, 209. Tottenham-court-road.

The almonds in this sample are coloured *deep pink*. The colour consists of the usual red pigment, probably *cochineal*. The *ash* furnished by the sugar portion amounted to 2·26 per cent.

7th Sample. — Purchased of R. Lumley, 427. Oxford-street.

Coloured with a non-metallic, red pigment, probably *cochineal*. *Ash*, 1·26 per cent.

8th Sample. — Purchased of W. C. Bowler, 13. Commercial-road.

Coloured with the usual *non-metallic, red pigment*. *Ash*, 1·72 per cent.

9th Sample. — Purchased of S. Martin, 118. Osborne-street, Whitechapel.

Coloured with a *non-metallic, red pigment*. *Ash*, 1·70 per cent.

ir colour being fixed in the fire, so that the ash of sugar articles coloured ny of these substances is of a bright blue, the tint varying according to ue used, as well as also in consequence of admixture with uncoloured nces, such as chalk, lime, or pipe-clay. These colours are somewhat ex- e, especially the true ultramarine, but they are of such intensity that a goes a great way; there is, however, a cheap kind of ultramarine, sold in ops as German or French ultramarine, the price being about sixpence per , and it is this blue pigment which is chiefly employed in the colouring of confectionery. This may be distinguished, when free from admixture other substances, by adding to it a little hydrochloric acid, and observing dour of sulphuretted hydrogen or rotten eggs evolved. This method of mination is, in the case of coloured sugar confectionery, for the most part licable, since sulphuretted hydrogen is almost invariably thrown off when- hydrochloric acid is added to the ash left on the incineration of most articles gar confectionery.

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alk is sufficiently identified by its appearance, by its effervescing on the on of an acid, and by the lime being thrown down from its solution by te of ammonia.

20th Sample.—Purchased of G. Bacon, 110. Houndsditch.
The confectionery in this parcel consists of comfits of different kinds, comfit lozenges made in various forms, rings, hearts, stars, &c., variously coloured, *pink*, *blue*, and *yellow*. The colouring matters employed being—for the pink *an organic red pigment*; for the blue, *artificial or German ultramarine*; and for the yellow, CHROME YELLOW, in rather large amount. *Ash*, slaty blue, 8·50 per cent.; residue deposited from watery solution chiefly *wheat-flour*, 10·46 per cent.

When this sugar is dissolved in water, the hydrated sulphate of lime is not deposited, but is chemically held in solution by the sugar, the solution being scarcely rendered turbid by the presence of the lime. The same thing occurs in other similar cases, where the proportion of lime is not very great indeed. This is a very convenient property of sugar for the manufacturers of sugar confectionery, since they are not liable to detection in using the hydrated sulphate of lime, except the sugar be burnt and the ash tested. It is really surprising how much lime is thus held dissolved.

21st Sample.—Purchased of F. Allen, 119. High-street, Whitechapel.
The contents of this parcel are similar to the above sample, the prevailing colours being *pink*, *bright blue*, and *yellow*. The colouring ingredients used are—for the pink, *a non-metallic red pigment*; for the blue, *artificial ultramarine*; and for the yellow, CHROMATE OF LEAD in considerable amount. *Ash*, brown, consisting of *hydrated sulphate of lime*, 14·56 per cent.; residue deposited from watery solution, chiefly wheat-flour, 16·00 per cent.

22nd Sample.—Purchased of J. Edwards, 15. James-street, Covent-garden.
This sample consists of coarse lozenges, hearts, and rings, similar to the last; the colouring ingredients employed being—for the pink, the usual *red pigment*; and for the yellow, CHROMATE OF LEAD. *Ash*, brown, consisting of hydrated sulphate of lime, 15·00 per cent.; matter insoluble in water, principally *wheat-flour*, 14·80 per cent

KISS-ME-NOW.

23rd Sample.—Purchased of S. Lyons, 18. Brick-lane, Spitalfields.
The contents of this parcel are in the form of large flat lozenges or medals of a very coarse description, vandyked round the edges, and having mottoes stamped upon the surface; they are coloured *pink* and *yellow*, and mixed with a few white ones. The colouring matters used are—for the pink, a non-metallic red pigment, probably *common cochineal*; and for the yellow, CHROMATE OF LEAD in considerable quantity. *Ash*, consisting of *hydrated sulphate of lime*, 7·70 per cent; residue thrown down from watery solution, mostly *wheat-flour*, 6·60 per cent.

24th Sample.—Purchased of G. Reading, 18. Church-lane, Whitechapel.
This sample is similar to the last, but the prevailing colour is *yellow*; this consists of CHROMATE OF LEAD in very considerable, indeed quite poisonous amount. *Ash*, brownish-grey, composed of hydrated sulphate of lime, 7·80 per cent.; residue thrown down from watery solution, chiefly *potato-flour*, 14·50 per cent.

25th Sample.—Purchased of S. Martin, 118. Brick-lane, Spitalfields.
The sweets in this parcel are in the shape of stars, very large, larger than a crown-piece, and exceedingly thin; they are mostly coloured *yellow*, but a few are white; the yellow pigment employed is CHROMATE OF LEAD, which is present in very large amount. *Ash*, pale yellow, 1·96 per cent.; matter insoluble in water, consisting of *potato-flour*, 13·15 per cent.

26th Sample.—Purchased of W. J. Odell, 28. Brick-lane, Spitalfields.
The contents of this parcel consist of flat lozenges, cut into the form of a rude imitation of a bird, and are coloured *deep pink*, *blue*, and *yellow*, mixed with a few uncoloured ones. The colouring ingredients used are—for the deep pink, the *non-metallic red pigment*; for the blue, *German or artificial ultramarine*; and for the yellow, CHROMATE OF LEAD, the latter in very large quantity. *Ash*, dull, light blue, 2·26 per cent.; matter insoluble in water, chiefly *East India arrowroot*, 18·32 per cent.

0*th Sample.*—Purchased of W. Sessers, 4. Drury-lane.
These almonds are coloured apparently with the same non-metallic, red pigment. They also furnished 7·90 per cent. of *ash*.

SUGARED ALMONDS.

1*th Sample.*—Purchased of J. Barrett, 24. New Church-street, Paddington.
The almonds in this parcel are coloured *deep pink* and *yellow*, mixed with *white* or uncoloured ones. The colouring matters used are, for the pink, an organic, red pigment, probably *cochineal;* and for the yellow, CHROMATE OF LEAD, in very considerable amount. *Ash*, 1·0 per cent.

2*th Sample.*—Purchased of W. Sessers, 4. Drury-lane.
The almonds in this sample are coloured *pink* and *yellow*, intermixed with a few *white* almonds. The colouring ingredients employed are, for the red pigment, a non-metallic pink, probably *cochineal;* and for the yellow, CHROMATE OF LEAD. *Ash*, 1·32 per cent.

3*th Sample.*—Purchased of M. Marchant, 303. Oxford-street.
The almonds in this parcel are coloured *pink*, *purple*, *blue*, and *yellow*, mixed with a few *uncoloured* ones. The colouring matters used are, for the pink, the usual non-metallic, red pigment; for the blue, *Prussian blue;* for the purple, *Prussian blue* mixed with red; and for the yellow, CHROMATE OF LEAD, the latter being present in immense quantity, so as to render the almonds quite poisonous. They were thickly and coarsely painted with the colouring matter, which, when touched with hydrosulphuret of ammonium, instantly turned quite black. *Ash*, very inconsiderable.

4*th Sample.*—Purchased of R. Kilner, 4. Hanway-street, Oxford-street.
The almonds in this sample are all of a *deep pink* colour, the colouring ingredient employed consisting of a non-metallic red pigment. *Ash*, very inconsiderable.

5*th Sample.*—Purchased of W. Offer, 3. Shepperds-market.
The almonds in this parcel are coloured *pink*, intermixed with a few *white* ones; the colouring matter employed consisting of the usual *non-metallic red pigment*. *Ash*, 1·76 per cent.

6*th Sample.*—Purchased of Mr. Blanchard, South-street, Manchester-square
The almonds in this parcel were *pink*, *yellow*, *salmon-colour*, and *pale purple*, mixed with a few *white* ones; the colouring matters employed being, for the pink, a non-metallic red pigment, probably *cochineal;* for the salmon-colour, a mixture of the usual red pigment, and some yellow colouring matter; for the purple, *Prussian blue*, combined with the non-metallic red, &c.; and for the yellow, CHROMATE OF LEAD, the latter in very large and poisonous amount. *Ash*, very inconsiderable.

SUGAR BUTTONS.

7*th Sample.*—Purchased of Mr. Hampton, Grafton-street, Soho.
These buttons are about the size of half-a-crown; they are white, and coloured here and there with *bright red*, which, on analysis, was found to consist of VERMILION, or bisulphuret of mercury.

SCOTCH MIXTURE.

8*th Sample.*—Purchased of S. Martin, 118. Brick-lane, Spitalfields.
The confectionery in this parcel consists of a mixture of various sweets, as comfits of different kinds, almonds, &c., coloured *pink* and *yellow*, intermixed with some white ones. The colouring ingredients used are—for the pink, a non-metallic red pigment, probably *cochineal;* and for the yellow, CHROME YELLOW OF CHROMATE OF LEAD, the latter in immense quantity. *Ash*, of a pale fawn colour, 2·20 per cent.

9*th Sample.*—Purchased of M. Marchant, 303. Oxford-street.
The sweets in this sample consist of a variety of comfits, almonds, &c. and coloured *pink*, *blue*, and *yellow*, intermixed with a few white ones. The colouring matters employed are—for the pink, *a non-metallic red pigment;* for the blue, *Prussian blue;* and for the yellow, CHROMATE OF LEAD, the latter being present in poisonous amount. *Ash*, brownish.

[illegible]

[illegible]

[illegible] Lozenges.

[illegible]

[illegible] Lozenges.

[illegible]

Yellow Rock.

[illegible] Purchased of Mr. Humphries, Do
[illegible] sugar, cast into lar
[illegible] "rock," the sur
[illegible] barley-sugar, with veins o
[illegible] The rock was a deep a
[illegible] with an essence which has so
The colouring matter consisted of [illegible]
[illegible]

Ginger Palates.

[illegible] Sample.—Purchased of S. Berry, 21. Great
These consist of large thick pieces of sugar co
long and three quarters of an inch thick, w
each. They are coloured throughout of an
with ginger; the pigment used was CHROMAT
lutely poisonous.

45th *Sample*.—Purchased of A. C. Bowler, 13. C
These are large yellow balls, flavoured with gin
ounce in weight; coloured *bright yellow*, the

Sample.—Purchased of A. C. Bowler, 13. Commercial-road.
ese are large, flat, oval, white lozenges or tablets, having the figure of a jockey printed upon their surface in light blue ink, the colouring ingredient employed being *German ultramarine*. *Ash*, somewhat blue, 1·52 per cent.; residue thrown down from watery solution, consisting chiefly of *potato-flour*, 2·30 per cent.

Sample.—Purchased of W. Carr, 14. Pilgrim-street, Doctors'-commons.
is sample consists of flat lozenges or tablets moulded in the form of a heart, some being *reddish-orange*, and others *yellow*, having a motto, or the figure of a man, bird, or flower, impressed upon them in *pink*. The colouring matters used are—for the orange pigment, a mineral colour containing lead, and probably RED LEAD; and for the yellow, CHROMATE OF LEAD; the lead in both kinds being in immense, indeed quite poisonous amount. *Ash*, reddish-yellow, 18·26 per cent., consisting of *hydrated sulphate of lime;* residue thrown down from watery solution, chiefly *wheat-flour*, 15·25 per cent.

COLOURED SHAPES.

Sample.—Purchased of G. Osborne, 33. Bishopsgate-street Without.
e sweets in this parcel are made up into various fanciful shapes, such as dice, rings, caps, hats, coffee-berries, &c., also into lozenges variously flavoured, in the form of clubs, diamonds, hearts, spades, and stars; they are coloured *pink*, *blue*, and *dull green*, intermixed with white caraway and other comfits. The colouring matters employed are—for the pink, a *non-metallic red pigment;* for the blue, *artificial ultramarine;* and for the dull green, BRUNSWICK GREEN. *Ash*, light, slaty-blue, 5·14 per cent.; residue insoluble in water, chiefly *wheat-flour*, 10·75 per cent.

Sample.—Purchased of W. Lumley, 427. Oxford-street.
e contents of this parcel are similar to the above sample, and coloured deep *pink*, *blue*, and *yellow*, intermixed with a few uncoloured cinnamon comfits, &c. The colours employed are—for the deep pink, the *non-metallic red pigment;* for the blue, *artificial ultramarine;* and for the yellow, CHROMATE OF LEAD, the latter being present in very large and even poisonous quantity. *Ash*, 2·18 per cent.; matter insoluble in water, chiefly *wheat-flour*, 7·00 per cent.

Sample.—Purchased of R. Kilner, 4. Hanway-street, Oxford-street.
is sample is somewhat similar to the last two, the chief colours being *pink*, *blue*, and *yellow*. The colouring ingredients used are—for the pink, the usual *non-metallic red pigment;* for the blue, the colour known as *Antwerp blue;* and for the yellow, CHROMATE OF LEAD in rather large amount; it was found likewise that the blue shapes contained a considerable quantity of lead. *Ash*, bright orange yellow, 1·96 per cent.; residue insoluble in water, chiefly *wheat-flour*, 4·75 per cent.

Sample.—Purchased of W. J. Odell, 28. Brick-lane, Spitalfields.
e confectionery in this parcel is made up into the form of stars, rings, and diamonds, and also into rude imitations of shells, apples, pears, carrots, &c. The colouring of all these is most vivid, embracing *pink*, *blue*, *green*, *orange*, and *yellow*. The colours used are—for the pink, the usual *non-metallic red pigment;* for the blue, *Antwerp blue;* for the green on carrot-tops, *pale* BRUNSWICK GREEN, *containing lead;* for the orange-coloured part of carrots, RED OXIDE OF LEAD; and for the yellow, CHROMATE OF LEAD, in large and poisonous amount. *Ash*, buff-coloured, 1·86 per cent.; matter insoluble in water, chiefly *wheat-flour*, 2·65 per cent.

Sample.—Purchased of Mr. Watkins, 26. Queen's Head Court, Princes-street.
e contents of this sample are similar to the last, but the colouring is much more bright and intense. The different shapes are variously coloured *pink*, *blue*, *orange*, *yellow*, and *green*. The colouring ingredients used are—for the pink, the usual *red;* for the blue, *Antwerp blue;* for the orange, RED LEAD; for the yellow, CHROMATE OF LEAD; and for the green, *pale* BRUNSWICK GREEN, in very large amount. *Ash*, orange-yellow, 1·66 per cent.; residue insoluble in water, mostly *wheat-flour*, 12·56 per cent.

for the yellow, CHROMATE OF LEAD,—both these latter in poisonous quantities. The ash furnished by the *blue* seeds is brownish red; by the g [illegible] and by the *green*, brownish; residue thrown down from water solution, chiefly *wheat-flour*, 5·72 per cent.

54th Sample.—Purchased of J. Bradley, 34. Leman-street, Whitechapel. The seeds in this sample are of a coarser description than the las coloured [illegible], *bright orange-red*, and *yellow*, mixed with The colours used are: for the blue, *Antwerp blue*; for the scarlet, RED and for the yellow, CHROMATE OF LEAD, both these being in large and serious quantities. Ash, 20·72 per cent., consisting principally of *hyd* [illegible]; the ash of the *blue* seeds was of a reddish colour, a the yellow, yellowish-grey; matter insoluble in water, chiefly *wheat-* 25·56 per cent.

55th Sample.—Purchased of S. Martin, 118. Brick-lane, Spitalfields. These seeds are coloured crimson with the usual *red pigment*, bright with *Antwerp blue* or *ultramarine*, scarlet with RED LEAD, and yellow with c MATE OF LEAD, the two latter to a poisonous extent. *Ash*, 1·78 per c that of the blue, deep blue; and of the *yellow* seeds, yellowish; resid precipitated from watery solution, chiefly *wheat-flour*, 9·36 per cent.

56th Sample.—Purchased of W. J. Odell, 28. Brick-lane, Spitalfields. The colours of these seeds are, *crimson, pale pink, light blue, dull gr* [illegible] *orange-yellow*, and *lemon-yellow*, intermixed with white globules. The colouring ingredients employed are: for the cr and pinks, the usual *non-metallic red*: for the blue, *Antwerp blue*; f dull greenish-blue, VERDITER, containing LEAD; for the grass-green, BRUNSWICK GREEN; and for the orange and bright yellows, the oran yellow CHROMATES OF LEAD, in large quantity. *Ash*, light reddish- [illegible] per cent.; matter insoluble in water, chiefly *wheat-flour*, 9·60 pe There are no less than three active poisons containing LEAD and COPPER present in this sample in considerable amount.

Cocoa-nut Candy.

57th Sample.—Purchased of J. Bradley, 34. Leman-street, Whitechapel. Cocoa-nut candy was made of common brown sugar, moulded in squa cakes, with thin slices of cocoa-nut introduced into it whilst still ho its surface was thickly covered with a layer of the same "hundre thousands," the analysis of which is given in Sample 54. This, ther is a highly deleterious article.

Transparent Sugar Confectionery.

58th Sample.—Purchased of G. Osborne, 33. Bishopsgate-street Withou This sample consists of transparent crystallised drops, hollow in the c filled with some flavoured syrup, and coloured *blue*; the colouring m being [illegible] *German ultramarine*. *Ash*, blue, 1·06 per cent.

59th Sample.—Purchased of R. Lumley, 427. Oxford-street. The contents of this parcel are precisely similar to the above, and co blue with *German ultramarine*. *Ash*, dull blue, 1·12 per cent.

60th Sample.—Purchased of W. J. Odell, 28. Brick-lane, Spitalfields. These sweets are somewhat like the last, but much smaller, and fla with peppermint. They are coloured *red* and *blue*. The colouring m used are: a non-metallic *red pigment*; and for the blue, *artificial* [illegible]. *Ash*, dull blue, 2·12 per cent.

61st Sample.—Purchased of J. Lussenden, 64. Broad-street, Bloomsbury. These drops are about the size of a raspberry, crystallised on the outsi coloured of a *deep rich pink*, nearly *crimson*, and quite transparen colour used consisting of a non-metallic red pigment, most probably *cochineal*. *Ash* inconsiderable.

62nd Sample.—Purchased of A. C. Bowler, 13. Commercial-road. The confectionery in this parcel is made up into the fo [illegible] rings, transparent, crystallised upon the outside, [illegible] centre filled with syrup. They are of a *deep blue* [illegible] employed being *German ultramarine*. *Ash*, [illegible] purpose of colouring consisting of CHROMATE OF LEAD in large amount. *Ash*, brownish-grey, 1·36 per cent.

Sample.—Purchased of W. T. Odell, 28. Brick-lane, Spitalfields. he sweets in this parcel are large cushion-shaped balls, about a quarter of an ounce in weight each, and white, but on one side coloured *bright pink*, and on the other a brilliant *blue* colour. The ingredients employed for the colouring being—for the bright pink, a *non-metallic red pigment;* and for the blue, *artificial ultramarine.* *Ash*, greenish-blue, 1·28 per cent.

Clove Sticks.

Sample.—Purchased of S. Berry, 21. Great Windmill-street, Haymarket. hese sticks are round, about half an inch thick, flavoured with the essential oil of cloves, and having spiral stripes of transparent sugar running round them; these stripes are coloured with the usual *red pigment*, while the substance of the sticks is dyed throughout with yellow, the pigment used being CHROMATE OF LEAD, in poisonous quantity.

Sample.—Purchased of G. Reading, 18. Church-lane, Whitechapel. is sweet, made of coarse brown sugar, and flavoured with oil of cloves, is in the form of long flat sticks, having bright red winding stripes around them. The colouring matter employed for the stripes consisted of RED OXIDE OF LEAD, or RED LEAD, and this in large and almost poisonous amount. *Ash*, 5·0 per cent.

Peppermint Pipe.

Sample.—Purchased of S. Martin, 118. Brick-lane, Spitalfields. e sticks have stripes of *pink*, *blue*, and *yellow*, winding spirally round them. The colouring matters employed are—for the pink, a *non-metallic red pigment;* for the blue, *artificial ultramarine;* and for the yellow, LEMON CHROME or CHROMATE OF LEAD, in large quantity; LEAD was also detected in the red stripes. *Ash*, blue, 6·36 per cent., consisting chiefly of *hydrated sulphate of lime.*

Sample.—Purchased of S. Berry, 21. Great Windmill-street. hese sticks are white, and have *bright blue* spiral stripes running round them; the colouring matter of the stripes consisting of *artificial ultramarine.* *Ash*, bright blue.

Ginger Pearls.

Sample.—Purchased of A. W. Hearn, 56. Tottenham-court-road. inger pearls, or *ginger seeds* as they are more commonly called, consist of small hollow globules of sugar, flavoured with ginger, and coloured outside of an intense *yellow*, the colour being due to the yellow pigment so employed in confectionery—namely, CHROMATE OF LEAD, and this was in amount absolutely poisonous. Matter insoluble in water, consisting chiefly of *wheat-flour* and *ginger*, 11·60 per cent.

Sugar Dragees.

Sample.—Purchased of R. Lumley, 427. Oxford-street. hese sweets are moulded in various forms, some being kidney-shaped, others crescentiform, or circular, or oval; they are hollow, crystallised in the centre, and filled with syrup flavoured with rose; one side of these ornaments is coloured *pink* or *purple*, and the other left *white*. The pink colouring matter is organic and most probably *rose-pink*, and the purple is composed of *Antwerp blue* and *rose pink*. *Ash* inconsiderable.

Coloured Sugar Seeds.

Sample.—Purchased of G. Reading, 18. Church-lane, Whitechapel. hese sugar-seeds are small round globules, about the size of a large pin's head or mustard-seed, and commonly known as "hundreds and thousands;" they are variously coloured, the colours in the present sample being *crimson*, *pink*, *orange*, *dark blue*, and *yellow*, intermixed with white globules. The colouring matters used are, for the crimson and pink, the usual *non-metallic red;* for the blue, *Prussian blue;* for the orange, RED-LEAD; and

76th Sample.—Purchased of A. C. Bowler, 13. Commercial-road.
In this case the colour was of a much brighter yellow, very differe
of the two preceding samples; and it was found that the colouring
consisted of that variety of CHROMATE OF LEAD termed LEMON CHR
very large quantity.

77th Sample.—Purchased of Mr. Humphries, Domville-row, Hammers
The colour of this sample was of a *bright lemon yellow*, but exceeding
and opaque; so thick indeed was the coat of paint, that the surfac
coarse and rough appearance, and the coating could be separated
knife, and if collected it would have weighed several grains. The
consisted of the light kind of CHROMATE OF LEAD, known as LEMON C
of which there was sufficient to render it quite poisonous.

78th Sample.—Purchased of ——, Farringdon-street.
This imitation of a lemon is very highly coloured; the pigment
consisting of GAMBOGE in very large quantity.

Plum.

79th Sample.—Purchased of A. W. Hearn, 56. Tottenham-court-road.
This sweet is moulded in the form of an egg-plum, and coloured
red in imitation of the natural fruit, the colouring matters used co
chiefly of a *vegetable red*, with, in parts, a small quantity of a yell
ment, containing CHROMATE OF LEAD. *Ash*, pinkish-grey, 1·12 per

Pears.

80th Sample.—Purchased of T. Holloway, 102. Drury-lane.
This sample consists of an imitation of a full-ripe pear, and is
coloured *yellow*, overlaid on one side with *bright orange red*; the c
ingredients employed are: for the red, the usual *non-metallic red*
which being laid on over the yellow, gives it the orange tint; and
yellow, GAMBOGE.

81st Sample.—Purchased of W. J. Odell, 28. Brick-lane, Spitalfields.
This confection, like the last, is also an imitation of a pear, and
coloured. The colouring ingredients used, being the same *non-*
red pigment, and for the yellow, CHROMATE OF LEAD in rather lar
portion.

Potato.

82nd Sample.—Purchased of W. J. Odell, 28. Brick-lane, Spitalfields.
This is also of a yellow colour, and is slightly tinted at one end with
of the usual *non-metallic red pigment*, the yellow consists of CHRO
LEAD.

83rd Sample.—Purchased of T. Holloway, 102. Drury-lane.
This potato resembled the previous sample in form and appearance,
coloured with a thinnish coating of GAMBOGE.

Swan.

84th Sample.—Purchased of T. Holloway, 102. Drury-lane.
The colours in this are: *yellow*, for the beak; *brown*, for the top of the
and a border of *dull green* round the base or stand. The yellow
consists of a thick coat of CHROMATE OF LEAD; the brown, of *umber*;
green of MIDDLE BRUNSWICK GREEN, containing CHROMATE LEAD.

Pigeon.

85th Sample.—Purchased of T. Holloway, 102. Drury-lane.
The pigments employed for colouring the pigeon, are: *light yellow*,
beak; *red* for the eyes; and *orange yellow*, for the base or stand. The
colour consists of the light kind of CHROMATE OF LEAD or PA
for the eyes, BISULPHURET OF MERCURY or VERMILION; and
the deeper variety of CHROMATE OF LEAD or ORANGE CHROME.

Cock.

86th Sample.—Purchased of T. Holloway, 102. Drury-lane.
The beak of this bird is coloured *bright yellow*; the comb,

d *Sample.*—Purchased of R. Lumley, 427. Oxford-street.
The contents of this parcel are similar to the last, and coloured *pale greenish-blue;* the colouring matter used being *Prussian blue. Ash*, orange colour.

h *Sample.*—Purchased of A. W. Hearn, 56. Tottenham-court-road.
This sample is precisely similar to the last, and coloured with *Prussian blue Ash*, fawn colour.

RASHER OF BACON.

Sample.—Purchased of J. A. Cooper, 209. Tottenham-court-road.
he rind of the bacon is indicated by a coating of a brown pigment, *Vandyke* brown, or some other ferruginous colouring matter; and the lean, by streaks of the red pigment commonly employed as the pink colouring ingredient for confectionery. *Ash* inconsiderable.

MUTTON-CHOP ON PLATE.

Sample.—Purchased of R. Lumley, 427. Oxford-street.
he plate is a white one with a deep blue border, brilliantly coloured with *artificial ultramarine*, while that portion of the chop which represents the muscle or flesh, is deeply coloured with the usual *red organic pigment. Ash* of border of plate, intense blue, 1·96 per cent.

OYSTER.

Sample.—Purchased of A. W. Hearn, 56. Tottenham-court-road.
e colouring ingredient used in this instance, consists of *burnt umber, Vandyke brown*, or some analogous ferruginous earth. The *ash* was of a deep reddish-brown, and weighed 1·72 per cent.

FISH.

Sample.—Purchased of W. Offer, 3. Sheppard's-market.
he tip of the nose and gills of the fish are coloured with the usual *pink*, while the back and sides are highly painted with that virulent poison, ARSENITE OF COPPER, SCHEELE'S GREEN, OF EMERALD GREEN.

STRAWBERRY.

h *Sample.*—Purchased of W. J. Odell, 28. Brick-lane, Spitalfields.
he colours in this article are *red*, with a *little yellow* and *green*, to indicate the calyx of the strawberry. The red is the usual non-metallic pigment, and the green consisted of BRUNSWICK GREEN, and consequently contained CHROMATE OF LEAD.

APPLES.

h *Sample.*—Purchased of J. Edwards, 15. James-street, Covent-garden.
he apples in this sample are coloured *yellow*, and on one side *deep red;* the yellow colour extending to a considerable depth into the substance of the sugar; the red consists of the usual *non-metallic pigment;* and the yellow is due to the presence of CHROMATE OF LEAD in really poisonous amount. *Ash*, 1·44 per cent.

Sample.—Purchased of A. C. Bowler, 13. Commercial-road East.
hese sugar-apples are coloured to the same deleterious extent as the former with CHROMATE OF LEAD.

ORANGES.

d *Sample.*—Purchased of W. Carr, 14. Pilgrim-street, Doctors'-commons.
his is a very unnatural imitation of an orange; it being coloured with a coarse and very uneven coating of RED LEAD.

d *Sample.*—Purchased of A. W. Hearn, 56. Tottenham-court-road.
his, on the contrary, is a very exact imitation of an orange; it is thickly coated, and, to a poisonous extent, with the variety of CHROMATE OF LEAD, known as *orange chrome. Ash*, dark rusty brown, 1·76 per cent.

LEMONS.

Sample.—Purchased of T. Holloway, 102. Drury-lane.
he surface of this lemon was coloured with GAMBOGE.

Sample.—Purchased of A. W. Hearn, 56. Tottenham-court-road.
he colouring matter used in this case was GAMBOGE. *Ash*, 1·26 per cent.

76th Sample.—Purchased of A. C. Bowler, 13. Commercial-road.
In this case the colour was of a much brighter yellow, very differen
of the two preceding samples; and it was found that the colourin
consisted of that variety of CHROMATE OF LEAD termed LEMON CH
very large quantity.

77th Sample.—Purchased of Mr. Humphries, Domville-row, Hammers
The colour of this sample was of a *bright lemon yellow*, but exceeding
and opaque; so thick indeed was the coat of paint, that the surfa
coarse and rough appearance, and the coating could be separated
knife, and if collected it would have weighed several grains. The
consisted of the light kind of CHROMATE OF LEAD, known as LEMON C
of which there was sufficient to render it quite poisonous.

78th Sample.—Purchased of ——, Farringdon-street.
This imitation of a lemon is very highly coloured; the pigment em
consisting of GAMBOGE in very large quantity.

PLUM.

79th Sample.—Purchased of A. W. Hearn, 56. Tottenham-court-road.
This sweet is moulded in the form of an egg-plum, and coloured pu
red in imitation of the natural fruit, the colouring matters used con
chiefly of a *vegetable red*, with, in parts, a small quantity of a yello
ment, containing CHROMATE OF LEAD. *Ash*, pinkish-grey, 1·12 per

PEARS.

80th Sample.—Purchased of T. Holloway, 102. Drury-lane.
This sample consists of an imitation of a full-ripe pear, and is
coloured *yellow*, overlaid on one side with *bright orange red;* the co
ingredients employed are: for the red, the usual *non-metallic red* p
which being laid on over the yellow, gives it the orange tint; and
yellow, GAMBOGE.

81st Sample.—Purchased of W. J. Odell, 28. Brick-lane, Spitalfields.
This confection, like the last, is also an imitation of a pear, and s
coloured. The colouring ingredients used, being the same *non-*
red pigment, and for the yellow, CHROMATE OF LEAD in rather lar
portion.

POTATO.

82nd Sample.—Purchased of W. J. Odell, 28. Brick-lane, Spitalfields.
This is also of a yellow colour, and is slightly tinted at one end wit
of the usual *non-metallic red pigment*, the yellow consists of CHRO
LEAD.

83rd Sample.—Purchased of T. Holloway, 102. Drury-lane.
This potato resembled the previous sample in form and appearance,
coloured with a thinnish coating of GAMBOGE.

SWAN.

84th Sample.—Purchased of T. Holloway, 102. Drury-lane.
The colours in this are: *yellow*, for the beak; *brown*, for the top of th
and a border of *dull green* round the base or stand. The yellow
consists of a thick coat of CHROMATE OF LEAD; the brown, of *umber*;
green of MIDDLE BRUNSWICK GREEN, containing CHROMATE LEAD.

PIGEON.

85th Sample.—Purchased of T. Holloway, 102. Drury-lane.
The pigments employed for colouring the pigeon, are: *light yellow*
beak; *red* for the eyes; and *orange yellow*, for the base or stand. Th
colour consists of the light kind of CHROMATE OF LEAD or PALE C
for the eyes, BISULPHURET OF MERCURY or VERMILION; and for th
the deeper variety of CHROMATE OF LEAD or ORANGE CHROME.

COCK.

86th Sample.—Purchased of T. Holloway, 102. Drury-lane.
The beak of this bird is coloured *bright yellow;* the comb, *brilliant*

wings and tail are variegated with *black*, two different *reds*, and *yellow*; while the stand, as in most of these sugar ornaments, is painted *green*. The yellow of the beak consists of CHROMATE OF LEAD; the comb and part of the red colour on the wings, of VERMILION; while the second red colour on the wings and tail is the usual pink *non-metallic colouring matter*, and the stripes of yellow consist of GAMBOGE; lastly, the green of the stand is MIDDLE BRUNSWICK GREEN, and therefore contains CHROMATE OF LEAD. In the colouring of this article, then, no less than three active poisons are employed, as well as that drastic purgative, GAMBOGE.

PHEASANT.

Sample.—Purchased of S. Martin, 118. Brick-lane, Spitalfields.

This sugar figure of a pheasant is highly coloured on the back with *pink* and *bright yellow*, the base on which it stands having a deep margin of *bright green* running round it. The colouring ingredients used are: for the pink, the usual *non-metallic red pigment;* for the yellow, GAMBOGE; and for the green of the stand, that deadly poison ARSENITE OF COPPER, SCHEELE'S or EMERALD GREEN. This sweet is, therefore, like very many of the others, highly poisonous.

DOG AND HARE.

Sample.—Purchased of A. C. Bowler, 13. Commercial road.'

The nose and ears of the dog, and the tongue of the hare, are coloured bright-red with VERMILION. The body is spotted with large patches of GAMBOGE and *burnt umber*, as also was the figure of the hare which lay at its feet; while the green pigment on the base, of which there was a very large quantity contained CHROMATE OF LEAD, and consisted of the pale variety of BRUNSWICK GREEN. *Ash*, dark reddish-brown, 2·0 per cent.

DOG.

th Sample.—Purchased of W. Offer, 3. Sheppard's-market.

The colouring ingredients used for painting this sugar dog are: for the ears and nose, the usual *non-metallic pigment;* for the chief part of the back, a ferruginous brown earth, most likely *burnt-umber;* and for the stand on which the dog is represented as reclining, ARSENITE OF COPPER OF EMERALD GREEN, in quantities so considerable as to be absolutely poisonous.

CROWN.

th Sample.—Purchased of F. Allen, 119. High-street, Whitechapel.

This article is of a light but intense blue colour, the colouring ingredient employed being *German* or *Artificial ultramarine;* this pervades the whole substance of the sweet; the pearls are imitated by white sugar, and the other ornaments of the crown are stained deep pink, with the usual *non-metallic red pigment*. *Ash*, dark blue, 2·12 per cent.

FIGURE OF WOMAN.

st Sample.—Purchased of A. W. Hearn, 56. Tottenham-court-road.

The head-dress of this figure is coloured bright yellow with CHROMATE OF LEAD; the eyes and shoes blue, with *German ultramarine;* the dress of a deep crimson, with the ordinary *red organic pigment;* and the ground with a few streaks of pale dull green. The only thing remarkable in the colouring of this sample is the large and poisonous quantity of CHROME YELLOW which enters into the painting of the head-dress.

FIGURES OF DANCERS.

nd Sample.—Purchased of J. Clarke, 17. Bishopsgate-street Without.

The head-dresses of both these figures are of a bright yellow colour, which was found to be CHROMATE OF LEAD; the bodies bright and intense crimson, with the usual *non-metallic red pigment*, and the ground on which the figures stand, yellow, with spots of brown; the colouring ingredients of the ground are: for the yellow, CHROMATE OF LEAD in large and poisonous amount; and for the brown, *burnt umber*. *Ash*, dirty green, 1·66 per cent.

That in *Four* of the samples, the colours used were painted on with
LEAD OR CARBONATE OF LEAD. This was the case in all the cake or

It further appears from the above analyses—

That *Thirteen* of the samples were adulterated with *hydrated sulphate*
the quantity varying from 4·3 to 43·66 per cent.

That *Twenty-one* of the samples were adulterated with different kinds o
in quantities varying from 1·66 to 25·56 per cent. In *Seventeen*
the farina consisted of *wheat-flour;* in *Three*, of *potato-flour*, and
East India arrow-root.

It will be observed that the list of colouring matters above enumer
cludes some substances of an injurious character, and many which are
the most virulent and deadly of the mineral poisons. Of those which
considered as more or less injurious, are *Ferrocyanide of iron* or *Prussi*
Antwerp blue, GAMBOGE, and *German* or *artificial ultramarine.* Among
which are deadly and poisonous, are—the three CHROME YELLOWS OR CHR
OF LEAD; RED LEAD OR RED OXIDE OF LEAD; WHITE LEAD OR CARBON
LEAD; VERMILION OR BISULPHURET OF MERCURY; the three BRUNSWICK
VERDITER OR CARBONATE OF COPPER; and EMERALD GREEN, SCHEELE'S G
ARSENITE OF COPPER.

It may be alleged by some that these substances are employed in q
too inconsiderable to prove injurious; but this is certainly not so, for the
used, as is amply indicated in many cases by the eye alone, is oft
large, and sufficient, as is proved by numberless recorded and con
occurring instances, to occasion disease, and even death; to some of t
stances we shall hereafter refer. It should be remembered, too, that
parations of lead, mercury, copper, and arsenic, are what are termed cu
—that is, they are liable to accumulate in the system little by little,
length the full effects of the poisons become manifested. Injurious
quences have been known to result from merely moistening wafers
tongue; now the ingredients used for colouring these include many
employed in sugar confectionery:—how much more injurious then m
consumption of sugar thus painted prove, when these pigments are
received into the stomach.

That deadly poisons, like the above, should be daily used for the me
of imparting colour to articles of such general consumption as sugar
tionery—articles consumed chiefly by children, who from their delicate
sation are much more susceptible than adults—is both surprising and lam
It is surprising, on the one hand, that the manufacturers of these articles
be so reckless as to employ them; and, on the other, that the authorities
tolerate their use.

In other countries, some of which we are in the habit of looking dow
as being behind ourselves, manufacturers of sugar confectionery using in
colouring ingredients are liable to penalties. In France the subject ha
deemed of sufficient importance to occupy the attention of the Minister o
and the Council of Health, and M. Andral, in 1830, at the instigation
Council, drew up a report, addressed to the Prefect of Police, on the
which may result from the use of coloured sugar confectionery, and h
gested remedies. The result of this report was the issuing of an ord
in which the practice of colouring sugar confectionery was most emph
denounced; the poisonous ingredients specified; the harmless enum
visits were made; penalties were inflicted; and it was further order
no confectionery should be sold, unless the papers in which it was
were stamped with the name and address of the confectioner. Lastly
edict the vendors were held responsible for all accidents occasioned by t
fectionery or liqueurs sold in their establishments.

Regulations more or less resembling the above are in force in Belgi
Switzerland; in Zurich, indeed, the use of colouring matters of all
interdicted.

Following the example of the Council of Health of Paris, we now furn
lists, one of colours the use of which may be permitted, and the other,

ese twelfth-cake ornaments represent roses with stems and leaves, a fish n blue water, a steam-vessel on the sea, and a human face and figure. The colours and the pigments used were nearly all similar to the previous ample, with the exception of the blue imitation of the water, the colouring matter here used being *ferrocyanide of iron*, or *Prussian blue.*

the case of all these cake ornaments, the colours are mixed up with WHITE OF CARBONATE OF LEAD, which renders them still more poisonous.

om an examination of the preceding extensive series of analyses of coloured r confectionery, it appears —

hat the principal colours employed are yellows, reds, including pink and scarlet, browns, purples, blue, and greens.

he yellows —

hat *Seven* were coloured with LEMON CHROME, or the pale variety of CHROMATE OF LEAD.

hat *Five* were coloured with ORANGE CHROME, or the deep variety of CHROMATE OF LEAD.

hat *Forty-seven* were coloured with the bright or canary-coloured variety of CHROMATE OF LEAD.

hat *Eleven* of the samples were coloured with GAMBOGE.

hile the colour of the majority of the above samples was confined to the ice, in many cases it was diffused equally throughout the whole mass of the r used.

he reds —

at *Sixty-one* were coloured with *organic pink* colouring matters, consisting in most cases of *Coccus Cacti*, or *cochineal.*

at in *Twelve* of the samples the colouring matter was RED LEAD, RED OXIDE OF LEAD, OF MINIUM.

at in *Six* cases the colouring ingredient consisted of VERMILION, CINNABAR OF BISULPHURET OF MERCURY.

e browns —

at *Eight* were coloured with *brown ferruginous earths*, either *Vandyke brown*, *Umber*, or *Sienna.*

e purples —

at two samples were coloured with a mixture of *Antwerp blue*, which consists principally of Prussian blue, and an organic red pigment, most probably *cochineal.*

e blues —

at one was coloured with *indigo.*

at *Eleven* were coloured with *Prussian blue*, or *ferrocyanide of iron.*

at *Eleven* were coloured with *Antwerp blue*, which is a modification of *Prussian blue.*

at in *Fifteen* samples the colouring matter consisted of GERMAN OR ARTIFICIAL ULTRAMARINE, which is a double silicate of alumina and soda with sulphuret of sodium.

e greens —

at *Five* samples were coloured with the *pale variety* of BRUNSWICK GREEN.

at *Four* were coloured with *middle* BRUNSWICK GREEN.

at *One* was coloured with the *deep variety* of BRUNSWICK GREEN.

ese greens consist of a mixture, in different proportions, of the CHROMATES EAD and *Prussian blue.*

at one sample was coloured with VERDITER OF CARBONATE OF COPPER.

at *Nine* were coloured with SCHEELE'S GREEN, EMERALD GREEN, OF ARSENITE OF COPPER.

e above colours were variously combined in different cases; as many as , four, five, six, and even seven colours, occurring in the same parcel of ctionery, including three and even four poisons. (See samples 32, 33, 53, 4 to 88, 94, 95, and 98 to 101.)

By an examination of these lists, it will be perceived that nearly all the su stances now employed by the manufacturers of coloured sugar confectione belong to the second or prohibited list. Even the first list contains the nam of two or three colours, the use of which is not wholly free from objection- as indigo, litmus, and sap-green; the two latter in consequence of their liabil to adulteration. Genuine litmus being a vegetable colour, is of course harmles but its use is rendered objectionable from its being frequently adulterated, ac cording to M. Andral, with common arsenic and peroxide of mercury.* Fro ultramarine, in contact with an acid, sulphuretted hydrogen is freely liberated and this liberation no doubt takes place readily in the stomach when any confe tionery coloured by this pigment is partaken of.

For ourselves, we altogether object to the practice of colouring articles of con sumption of all kinds and descriptions: while it merely gratifies the sense of sigh it serves to conceal other adulterations, and is attended in a variety of ways an the greatest danger to health. The danger arises, not merely from the wilful em ployment of substances of known hurtfulness, but also from their use throug ignorance and accident. The excuse of ignorance may tell somewhat in favour o manufacturers, who in some cases may not be aware of the deadly nature o the articles which they daily use, knowing them only by their common or popul names.

Serious as the results recorded in these analyses really are, we have reason t believe that, some years since, things were even worse, and that nothing w more common than to meet with articles of sugar confectionery coloured wi verdigris or acetate of copper, with the verditers or carbonates of copper, an with mineral green or arsenite of copper, all of which are virulent poisons.

We will now refer to a few of the cases recorded of poisoning resulting fro the use of coloured sugar confectionery.

In September, 1847, Mr. Hetley, visiting surgeon to the Marylebone In firmary, was requested to go as quickly as he could to Marylebone-lane, to se several persons who had been taken suddenly and dangerously ill.

He found three adults and eight children severely affected with vomiting an retching; the angles of their mouths and their linen were coloured green by th ejections. On inquiry into the case, one of the children stated that he ha bought two-pennyworth of some coloured confectionery ornament, of whic they had all partaken. The symptoms appeared within ten minutes of its bein taken, and evidently corresponded to those produced by poisoning with verdigri or diacetate of copper. Some of the offending article (a thin cake of sugar an Paris plaster mixed, covered with a layer of bright green) was, however, found which at once made the case clear.*

Dr. Guy, in commenting on the above case, states, that "an accident on a large scale, but happily unattended by any fatal result, occurred in our own experi ence, one of the patients having been brought to the King's College Hospital on the day after the accident. An ornamental green basket, after having been use at an evening party, was given to one of the attendants, who distributed th fragments among the inmates of a large workshop. Severe vomiting an purging was the result."†

About the same time a terrible occurrence, arising out of a similar cause, took place at Nottingham. Mr. W. Cowfield, with twenty others, was poisoned at a public dinner given in that town, on the 7th of June, 1848. Mr. Cowfield los his life. It appeared, on the investigation which followed, that he had partaken of a blancmange, the top of which was coloured with emerald green or arsenite of copper.

In February, 1849, Dr. W. Fergus published the cases of three children, wh were poisoned by eating the green sugar ornaments from a twelfth-cake.‡

In the month of June following, Professor Christison exhibited to the Member of the Edinburgh Medico-Chirurgical Society a green powder, which he ha purchased at a confectioner's in that city. It was a portion of the stoc employed to colour jellies, &c.; and on examination he found that it consisted o sugar, mixed with verdigris and Scheele's green. His attention was drawn to employment of which should be strictly prohibited, on the ground re all more or less dangerous to the public health, and most of tely poisonous.

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* Pharmaceutical Journal, vol. vii. p. 159, 1847.

† Ranking's Abstract. vol. vii. p. 347.

‡ Medical Gazette, p. 394.

urs, the Use of which may be permitted.

YELLOWS.

ies.
o, or yellow lake.
ies.
o.
bark.
o.
o.

REDS.

to, including
od.
o.
r lake.

PURPLES.

ple.
d indigo.
akes, with indigo or litmus.

BLUES.

GREENS.

juice of Rhamnus cathar-
, or French berries and
vegetable yellows, or lakes,
o, including Persian berries
o.

f the above colours one, een, is certainly liable to lulteration, and it is stated is so likewise.

List of Colours, the Use of which should be prohibited.

YELLOWS.

Gamboge.
The three chrome yellows, or chromates of lead.
Yellow orpiment, or sulphuret of arsenicum.
King's yellow, or sulphuret of arscenicum, with lime and sulphur.
Iodide of lead.

REDS.

Red lead, minium, or red oxide of lead.
Vermilion, or bisulphuret of mercury.
Red orpiment, realgar, or bisulphuret of arsenic.
Iodide of mercury.

BROWNS.

Vandyke brown.
Umber.

PURPLES.

All purples resulting from the mixture of any of the prohibited reds or blues.

BLUES.

Prussian blue, or ferrocyanide of iron.
Antwerp blue, a preparation of Prussian blue.
Cobalt.
Smalt, a glass of cobalt.
Verditer, or carbonate of copper.
Ultramarine, a double silicate of alumina and soda, with sulphuret of sodium.
German or artificial ultramarine, which resembles in its composition natural ultramarine.

GREENS.

The three Brunswick greens.
Mineral green, or carbonate of copper.
Verdigris, or di-acetate of copper.
Emerald green, or arsenite of copper.
The true Brunswick greens, or Oxychlorides of copper.

THE VARIOUS BRONZE POWDERS.

Gold, silver, and copper bronzes; these consist of alloys, in different proportions, of copper and zinc.
White lead, or carbonate of lead.

an apparent slight reaction in favour of ale; but this is hardly real, as the returns show that very nearly, if not quite as much porter is consumed as ever, in proportion to the increased population, while there is a greatly increased consumption of ales in addition.

Porter and stout should be brewed of malt and hops only, and the colour, as well as flavour, should be due to these alone.

The colour of all malt liquors is dependent upon the degree of heat to which the malt has been subjected in the kiln, and upon the amount of ripeness the hops have attained before being stripped from the poles. Thus, for the pale bitter ales the greatest care is necessary to prevent the husk of the malt from charring in the least, and to maintain the original straw colour of the barley; and in the selection of the hops, that they should be picked as soon as sufficiently ripe to keep, and that no single brown or withered leaf should be suffered to remain. The reverse of all this is the case with the malt and hops required for porter. The malt should be briskly dried, until the flower of the grain is of a light brown colour, and crushes with a crisp friability between the teeth; the hops, also, should have hung in the autumn sun till they have attained a rich golden hue, and the seeds are perfectly developed. With all attention to these requirements, however, the beer brewed would still be far from the necessary colour and flavour, and to attain these the malster is compelled to prepare malt in a peculiar manner. It must be remembered, nevertheless, that the strength of the porter is due almost entirely to the pale malt, as the other kinds have their saccharine properties so dried up and burnt as to render them nearly useless, except for colour and flavour, as before mentioned.

In addition to these distinctive properties of porter and stout, there is one other of still greater importance — the peculiarity of the fermentation. Up to the commencement of this last stage of the process of brewing, the manufacture of porter is conducted in exactly the same manner as that of ale, with the addition of the different flavouring malts before mentioned; but during the fermentation the great difference is effected, as all the sugar is converted into spirit, excepting only such portion as is required to preserve the beer from the acetous fermentation, which is less than in ale, by reason of the larger amount of hops used in proportion to the strength of the wort. The difference will be best appreciated by the figures on the next page. Good porter should weigh about twenty-two pounds specific gravity above water per barrel of thirty-six gallons before the fermentation, and single X ale about the same; but after fermentation, the porter will be found to retain only five pounds weight per barrel, while the ale has seven. Thus, ordinary ale is more liable to derange the stomach, by reason of its greater sweetness, while porter is more heady in proportion to its strength, and soporific in its tendency, from the strong infusion of hops in its composition.

It may be interesting to make a few remarks, succinct as possible, upon the preparation of malt and hops before they come into the brewers' hands; and upon isinglass, the only substance which should be used for fining beer. It may be well to observe, before doing this, that sugar is permitted by law to be used for brewing, and has been and will be consumed extensively whenever malt rises to a sufficiently high price to render it profitable: nevertheless, it is advisedly the dogma that "porter and stout (and indeed all malt liquors) should be brewed of malt and hops only," as was enunciated in the commencement of this paper; for beer brewed from sugar has greater tendency to the acetous fermentation than malt liquor, so that, setting aside the undoubted superiority of flavour in the latter, the risk, both pecuniary and otherwise, is too great to tempt the prudent man of business.

Malt is barley in which germination has been carried on to a certain extent, and then suddenly cut off by the application of heat: the process is conducted as follows:— After steeping the barley in a cistern of water till well swollen, it is thrown in layers on the slate floors of the long malt-house, buildings well known; it then heats and germinates very quickly; it is not, however, allowed to rest, but is turned over from time to time, until every grain has been alike exposed to the air, and to such light as is permitted to enter, which is not great, as the growth would otherwise be forced too speedily; and the object to be attained is the conversion of the starch into sugar, which is known to be come severe illness of two maid-servants who had partaken of some jelly red with it.*

Letheby, in May, 1850, made known the particulars of some cases which under his observation in the London Hospital.†

Iannah M——, aged four years and a half, Jane E——, aged ten years, melia Levi, also aged ten years, were admitted into the London Hospital nday, April 28th, suffering from violent sickness and great prostration of gth. It appeared that they had bought some sugar ornaments and coloured ctionery from a Jew in Petticoat-lane, and that, soon after they had par- of these sweetmeats, they became very sick, complained of a burning tion in the mouth, fauces, and œsophagus, of great pain in the stomach and men, and were seized with violent retching, which was attended, after a few s, with profuse purging. When they were admitted into the hospital they seriously ill, for the features looked pale and shrunk, the extremities were ly cold, the pulse was in each case small and feeble, and the surface of the , especially of the last-named child, was covered with a clammy perspiration. tics of sulphate of zinc were instantly administered, and the vomited matters saved for analysis. Antidotes of milk, white of eggs, and demulcents, also given in great abundance, and, after the sickness had subsided, they e permitted to sleep, from which state they awoke considerably relieved. vomited matters were evaporated to dryness, and the solid residue, not unting to two drachms in weight, yielded abundant evidence of the presence rsenic, copper, lead, iron, and zinc, all of which metals, excepting the last- ed, had doubtless been derived from the confectionery of which the children partaken. On making inquiry into the matter, we were informed that ween thirty and forty children had been attacked in a similar way, and that y had all purchased sweetmeats from the Jew in question; but it does not ear that he was acquainted with the poisonous nature of his merchandise, for had purchased it, so he stated, as the refuse stock of a large and very pectable firm in the City."

I have been induced to record," states Dr. Letheby, "the preceding cases, so much for the purpose of exhibiting the nature of the symptoms observed, with the view of showing the necessity for some legislative interference in a tter of what may truly be termed wholesale public poisoning; for, without h evidence before the mind, it would not be credited by the great bulk of the mmunity, that many of the prettiest and daintiest looking confections of the sert-table are, like the choicest luxuries of the Queen-mother (Catherine Medicis), but too often the source of danger to those who partake of them. thin the last three years no less than seventy cases of poisoning have been ced to this source; and how many, may we ask, have escaped discovery?"

PORTER, AND ITS ADULTERATIONS.

London public are indebted for porter, their favourite beverage, to a brewer the name of Harwood, who introduced it in the year 1730.

At this period it was probably not possessed of such distinct features as at sent, as the drink in favour up to that time had been a mixture of ale and r, sold at twopence per measure then in use. Porter being intended to ersede this mixture, no doubt at first resembled it in strength, flavour, and our, and the present empyreumatic and strong bitter flavour, and the other racteristics which distinguish the porter of the present day, were the results gradual experiment, and the growing favour with which the new compound received. The popularity which porter has attained may be judged of when s remembered, that until the last few years it had entirely excluded the nufacture of ales from the leading breweries in London; now, again, there is

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[*] Lond. Journal of Medicine, vol. i. p. 792.

[†] Medical Times, vol. iv. p. 792.

[illegible] mode of preparati [illegible] and flav [illegible] preserved by their method of preparati [illegible]

[illegible] but [illegible] very powerful th [illegible] great improvement in cu [illegible]

[illegible] process, and it may be raised in h [illegible] of them, are pick [illegible] by women and children principal [illegible] temporary employment: they are th [illegible] but the heat is much les [illegible] A small portion of sulphur [illegible] for the purpose, in the first place, of preserving th [illegible] may be some truth in it, as th [illegible] remaining in the hops, but the gre [illegible] property, which renders the hop [illegible] After they have been thus dried and bleached the [illegible] or pockets as they are called, to e [illegible] hydraulic press that the [illegible]

[illegible] and the Belgians, finding th [illegible] great effect upon the eye, have followed o [illegible] the custom of their ancestor [illegible] with increased attention [illegible] equal to the best Engli [illegible]

[illegible] as follows:—When the hops are ripe t [illegible] and the hops are left on the poles [illegible] preserves the aroma entirely, and all the essent [illegible] they are packed loosely in bales, a [illegible] strength and flavour in proportion their [illegible] It is somewhat premature to speak [illegible] of the hops compared with th [illegible] hops are a recent importation; in c [illegible] would be unsuitable; b [illegible] the comparison, that great care should [illegible] is not affected; and also, tha [illegible] there is no doubt much of the essent [illegible] drying process.

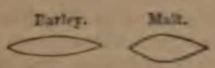
Hops [illegible] manner will frequently become brown a [illegible] they are wholly unsaleable; but [illegible] demand for hops at the present time, in con quence of the [illegible] during the season which has just passe [illegible] description of foreign hops are purchased, and subjec to [illegible]—by which means their colour is restored, and their property checking fermentation revived. To effect this, as much as 10 lbs. of sulph are employed in some cases for every hundredweight of hops. Dr. Leth states that in one sample he analysed he found as large a proportion as per cent. of free sulphuric acid, which had been formed by the subsequ oxidation of the sulphurous acid generated during the bleaching process.

Having touched, though imperfectly and cursorily, upon malt and hop few words upon isinglass will complete the account of the materials use the brewing of porter.

The best isinglass comes from Russia, but a very large supply from Brazils: that used by brewers is the cartilage of the sturgeon and other The brewer buys it as imported, in rough pieces, as also the dressings pickings rejected in the preparation of the finer sorts of isinglass for the fectioner, &c. The "finings" for porter are thus prepared:— put into some sour beer to dissolve, technically to cut, wh different times, according to the kind of isinglass made use

A small portion of this solution is added to every cask of

ıat is called the acrospire has reached three parts of the way up
ticularly observable by a thickening in the back of the grains of
ı the grain has arrived at this condition, it is thrown into the



r of about three inches in thickness, and while there constantly
The kiln has a perforated bottom, through which the heated air
urnace of Welsh coal ascends. The briskness of the fire and the
ŗ depend upon the colour required in the malt. The process is
, with the exception of screening away the "malt-dust,"—the
the embryo plant, technically so called, a very nutritious food for
ich also does duty sometimes for ground coffee, Scotch snuff, and
ɔther things besides.

e of malt, the brewer is guided by the growth of the acrospire, as,
ıfficiently developed, there is less saccharine matter in the grain
te, and more gluten; and, if overgrown, the saccharine matter is
ıe progress of the germination.

ns, besides saccharine matter, a substance called dyastase, which,
ın, by the action of hot water, and agitation by machinery, con-
ʼeater portion of the already partially-converted starch into sugar
t in the malt before immersion.

ılt thus manufactured is the base and strength of all malt liquors.
s to notice the other malts used for the purpose of flavouring and
t and porter.

t, used in the proportion to pale malt of one-eighth part, differs
ng dried rather faster than the ordinary kind, and by a hotter fire.
of the flavour of porter is much dependent upon this malt.

ılown malt is of the usual colour externally, but internally it is
ı-brown colour. It is manufactured by being placed in the kiln
ɔnly one inch in thickness, and dried by a fierce fire of wood in a
ıce of time. This malt, used in the proportion of one-half of the
the source of the rich empyreumatic flavour of porter, and does
its colour; but this is finally effected by what is called patent
of a very dark brown colour. This malt is pale malt, perfected
the ordinary way, and then roasted in a similar manner to coffee,
initely larger scale. The colour of porter, as before mentioned,
due to this malt; but it is so powerful an agent, that no more than
ırt of it is used in proportion to the other malts. Mr. Walmsley,
ıad, Mile-end, is the principal maker of these malts for porter.
ıst in quality, and many improvements in the manufacture are due

ext demand our attention; but to consider the kinds and cultiva-
ılly would occupy more space than can be afforded.

very delicate and precarious crop, affected greatly by the weather,
fall a prey to various kinds of blight, of which the most de-
the fly, technically so-called, and the mould or rust. The
well-known green insect and black fly, that attack the rose plants
me as, and accompanied with, honey dew; and its ravages are so
ree-fourths of the year's crops are sometimes sacrificed. The
gus which attacks the hop itself, and not only prevents its proper
and thus destroys its preservative properties, but also communi-
ıasant flavour to the beer. Like the vine, the hop loves the sun,
ely have too much of it; it also resembles that plant in the soils
it most prefers—the sunny sides of sloping hills, and the well-
l of Kent, resting on the Kentish rag or ironstone. The most
re grown in East Kent, and the next in estimation, in mid-Kent,
ıasons, the hops grown in Kent nearly suffice for all the malt
d in England; but in seasons like the last—a most disastrous one
s are much used. Hitherto, the hops grown in Belgium have been
e best, and, in appearance, there is no doubt they are so, as the

Linseed, one ounce.
Cinnamon, two drachms.

The essentia bina, he states, "is compounded of 8 lbs. of moist suga in an iron vessel, for no copper one could withstand the heat sufficienti comes to a thick, syrupy consistence, perfectly black and extremely bitt

Colour "is composed of 8 lbs. of moist sugar, boiled until it obtains state between bitter and sweet, and which gives to porter that mild, colour usually so much admired."

The heading "is a mixture of half alum and half copperas, ground t powder; and is so called from giving to porter the beautiful head o which constitutes one of its peculiar properties, and which landlords anxious to raise to gratify their customers."

Mr. Morris gives the following receipts:—

Malt, 25 quarters.

	cwt.	qrs.	lbs.
Hops - - - -	1	2	0
Cocculus Indicus berry - -	0	0	6
Leghorn juice - - -	0	0	30
Porter extract			

Malt, 20 quarters.

	cwt.	qrs.	lbs.
Hops - - - -	2	0	0
Cocculus Indicus berry - -	0	0	4
Sugar - - - -	0	0	28
Fabia amara (nux vomica) - -	0	0	6

And also the following directions:—

To make up a Vat of 150 *Barrels.*

"Use half a barrel of colouring, a quarter of a hundredweight of cre tartar, a quarter of a hundredweight of ground alum, one pound of salt of and two barrels of strong finings. Mix these well together, and put the vat, rousing it thoroughly at the same time. Let the vat remain open days, then close it and sand it over.

"In a fortnight it will be fit for use—your own good sense will infor how to advantage."

The extensive employment of various drugs for porter-brewing led establishment, at about the period of the late French war, of a class o termed "brewers' druggists." These persons issued regular price cu and they made it their business to send travellers all over the country wi and samples exhibiting the price and quality of the articles manufactu them.

Mr. Accum* states that "their trade spread far and wide, but it was a the country brewers chiefly that they found the most customers, an amongst them, up to the present day, as I am assured by some of thes rators, on whose veracity I can rely, that the greatest quantities of u ingredients are sold."

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* Treatise on Adulterations of Food, &c., p. 154.

t being lighter, it almost immediately ascends, and carries up with it
rity, leaving the beer as clear as wine. It may, perhaps, be well to
hat the brewer sends finings, prepared as above described, to each of
ns he supplies, and they are, by them, added to the beer as may be
isite.

ny of the preceding details respecting the different varieties of malt
nd their uses in the preparation of the several kinds of porter and ale,
ebted to Mr. Thomas Druce, of the old and highly respectable firm of
Sons, Hans-town Brewery, Chelsea.

given a very brief sketch of the manufacture of porter, we will next
consideration of the subject of its adulteration.

r may be the present practice with respect to the adulteration of beer,
question but that some years ago all kinds of malt liquor were exten-
terated in a variety of ways, and this notwithstanding that Acts of
had been passed for the special purpose of preventing such adulte-
f this fact abundant evidence is to be obtained.

or of a "Practical Treatise on Brewing," published some thirty-five
and which passed through eleven editions, observes, after enumerating
redients employed for brewing porter, "That, however much they
ise, however pernicious or disagreeable they may appear, he has
d them requisite in the brewing of porter, and he thinks they must
be used by those who wish to continue the taste, flavour, and appear-
beer. And though several Acts of Parliament have been passed to
rter-brewers from using many of them, yet the author can affirm,
ience, he could never produce the present flavoured porter without
intoxicating qualities of porter are to be ascribed to the various
mixed with it. It is evident some porter is more heady than others,
s from the greater or less quantity of stupifying ingredients. Malt,
intoxication, must be used in such large quantities as would very
ish, if not totally exclude, the brewers' profit." *

writer, Mr. Morris †, describes and recommends a variety of articles
loyed in the brewing of beer and porter, as colouring, cocculus
eet flag root, quassia, coriander seeds, capsicum, caraway seeds,
radise, ginger, beans, oyster-shells, and alum. "The colouring,"
remarks, "gives a good face to the beer, and enables you to gratify
your different customers." And again — "Beans tend to mellow
and from their properties add much to its inebriating qualities; but
ot be used in too large a quantity. Oyster-shells are very good to
r beer."

s generally put into the vat, as it gives the beer a smack of age."

us Indicus is used as a substitute for malt and hops, and is a great
e of malt liquor. It prevents second fermentation in bottled beer,
uently the bursting of the bottles in warm climates. Its effects are
iating nature."

or first quoted, Mr. Child, gives the following receipt for porter: —

1 quarter of malt.
8 lbs. of hops.
9 lbs. of treacle.
8 lbs. of liquorice-root.
8 lbs. of essentia bina.
8 lbs. of colour.
Capsicum, half an ounce.
Spanish liquorice, two ounces.
Cocculus Indicus, a quarter of an ounce.
Salt of tartar, two drachms.
Heading.
Ginger, three ounces.
Lime, four ounces.

Child on Brewing Porter.

† Morris on Brewing Malt Liquors.

Linseed, one ounce.
Cinnamon, two drachms.

The essentia bina, he states, "is compounded of 8 lbs. of moist sugar. in an iron vessel, for no copper one could withstand the heat sufficientl comes to a thick, syrupy consistence, perfectly black and extremely bitte

Colour "is composed of 8 lbs. of moist sugar, boiled until it obtains a state between bitter and sweet, and which gives to porter that mild, colour usually so much admired."

The heading "is a mixture of half alum and half copperas, ground tc powder; and is so called from giving to porter the beautiful head of which constitutes one of its peculiar properties, and which landlords anxious to raise to gratify their customers."

Mr. Morris gives the following receipts:—

Malt, 25 *quarters*.

	cwt.	qrs.	lbs.
Hops	1	2	0
Cocculus Indicus berry	0	0	6
Leghorn juice	0	0	30
Porter extract			

Malt, 20 *quarters*.

	cwt.	qrs.	lbs.
Hops	2	0	0
Cocculus Indicus berry	0	0	4
Sugar	0	0	28
Fabia amara (nux vomica)	0	0	6

And also the following directions:—

To make up a Vat of 150 *Barrels*.

"Use half a barrel of colouring, a quarter of a hundredweight of cr tartar, a quarter of a hundredweight of ground alum, one pound of salt o and two barrels of strong finings. Mix these well together, and put the vat, rousing it thoroughly at the same time. Let the vat remain ope days, then close it and sand it over.

"In a fortnight it will be fit for use—your own good sense will infor how to advantage."

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w days ago, standing in the broad daylight of midday, before a publican's
or gin palace."

he Act of Parliament, 56 Geo. III., c. 52., prohibited chemists, grocers, and
gists from selling ingredients for adulteration to brewers under a heavy
lty. Amongst the prohibited articles specified are "any liquor called by
name of, or sold as colouring, from whatever material the same may be
e; or any material or preparation other than unground brown malt for
ening the colour of worts or beer, or any liquor or preparation made use of
arkening the colour of worts or beer, or any molasses, honey, vitriol, quassia,
ulos Indicus, grains of paradise, Guinea pepper or opium, any extract or
aration of molasses, or any article or preparation to be used in worts or
, for or as a substitute for malt and hops; and if any druggist shall offend
ny of these particulars, such liquor, preparation, molasses, &c., shall be
ited, and may be seized by any officer of Excise, and the person so offend-
hall for each offence forfeit 500*l.*"

the same Act it is stipulated, — "That no brewer, or dealer, or retailer of
shall receive or have in his possession, or make, or use, or mix with, or
nto worts or beer, any liquor, extract, calx, or other material or preparation
he purpose of darkening the colour of worts or beer, or any liquor, extract,
or other material or preparation other than brown malt, ground or un-
nd, as commonly used in brewing; or shall receive or have in his possession,
e, or mix with, or put into any worts or beer, any molasses, honey, liquorice,
l, quassia, cocculus Indicus, grains of paradise, Guinea pepper or opium,
y article or preparation whatever, for or as a substitute for malt and hops,
pain that all such articles and preparations as aforesaid, and also the said
and beer shall be forfeited, together with the casks, vessels, and other pack-
and may be seized by any officer of Excise; and such brewer of, dealer in,
ailer of beer so offending, shall for each offence forfeit 200*l.*"

1819, a committee of the House of Commons sat to examine into the price
uality of beer. In the evidence taken before this committee a variety of
nation is recorded respecting the adulteration of beer and porter as it
iled at that time. A list is there given of twenty-nine *druggists* and
rs who were prosecuted and convicted, from the year 1812 to 1819, for
ying illegal ingredients to brewers for adulterating beer. Amongst the
es specified as thus supplied, are cocculus Indicus, molasses, and liquorice.

At about the period of the late war, when the price of malt was very high,
ondon brewers," writes Accum, "discovered that a larger quantity of wort
given strength could be obtained from pale than from brown malt. They
fore increased the quantity of the former, and diminished that of the latter.
produced beer of a paler colour, and of a less bitter flavour. To remedy
disadvantages they invented an artificial colouring substance, prepared by
ng brown sugar till it acquired a very dark-brown colour; a solution of this
employed to darken the colour of the beer. Some brewers made use of the
sion of malt instead of sugar colouring. To impart to the beer a bitter
, the fraudulent brewer employed quassia-wood and wormwood as a substi-
for hops.

But as the colouring of beer by means of sugar became in many instances
text for using illegal ingredients, the legislature, apprehensive of the mis-
that might, and actually did result from it, passed an Act, in July, 1817,
ibiting the use of burnt sugar.

No sooner had the beer-colouring Act been repealed, than other persons
ined a patent for effecting the purpose of imparting an artificial colour to
er, by means of brown malt, specifically prepared for that purpose only.
beer coloured by the new method is more likely to become spoiled than
coloured by the process formerly practised. The colouring malt does not
in any saccharine matter. The grain is, by mere torrefaction, converted
a gum-like substance, wholly soluble in water, which renders the beer mor
to pass into the acetous fermentation, than the common brown malt
ble of doing; because the latter, if prepared from good barley, contain
on of saccharine matter, of which the patent malt is destitute.

But as brown malt is generally prepared from the worst kind of barley,
patent malt can only be made from good grain, it may become, o

Another portion of the porter, equal to the above, should be evapora dryness, and the weight of the extract determined; this should afterwar burnt, the ash weighed, and, if necessary, tested for salt and iron.

The several results thus obtained are then all to be calculated to the imp gallon of 70,000 grains.

It is scarcely necessary to observe that the detection of many org infusions sometimes employed in the adulteration of porter and beer, is, in m cases, a matter of extreme difficulty, and in others it is altogether impossib the present state of science.

One of the most injurious of the substances thus employed is the extr prepared from the seeds or berries of cocculus Indicus. Its detection in be and especially in porter, is attended with very great difficulty; and in ma cases, when employed in small quantities, it cannot be discovered by any kno means. Mr. Herapath has recently published the results of some experime instituted with the view of determining the presence in beer of picrotoxin, th active and poisonous principle of cocculus Indicus. He directs that the beer porter should be first treated with an excess of acetate of lead, so as to thr down all gum and colouring matter. The clear liquor is then to be separat by filtration, and the excess of lead precipitated by sulphuretted hydroge After standing for some time, or boiling so as to get rid of uncombined su phuretted hydrogen, it is to be filtered again. The liquor, thus obtained, is be evaporated at a moderate temperature until it becomes rather thick, and th it is to be treated with a little pure animal charcoal. After standing for so time the charcoal is to be collected on a filter, washed with very little wat and dried at a steam heat. The charcoal contains the picrotoxin, which may separated by boiling with a little pure alcohol, filtering, and evaporating to dr ness on slips of glass. The picrotoxin is recognised by its forming plumo tufts of acicular crystals, or else by its producing oat-shaped forms.

M. Lassaigne has stated that picric acid is sometimes used to impart a bitt taste to beer and porter, and that it may be thus detected. He finds that this su stance is not precipitated by subacetate of lead, which throws down most of t other colouring matters of beer, as well as the bitter principle of hops, and al that it is not absorbed by common bone charcoal thoroughly purified by aci By means of one or other of these substances, he succeeds in obtaining a tolera pure solution of picric acid. M. Lassaigne states that while pure beer is alm entirely decolorised by either subacetate of lead or purified bone charc beer adulterated with even the one twelve-thousandth or the one eightee thousandth part of picric acid, remains of a yellow citron colour. Suppos the beer to contain a still more minute quantity of picric acid, it must, sub quent to the use of one or other of the above substances, be evaporated un the yellow citron colour is produced. It is possible that by the above meth picric acid might be detected in poor and pale beers, but we very much do whether it would be successful in the case of London stout and porter, whi are not entirely decolorised by either subacetate of lead or purified charcoal.

In order to save repetition, and to enable the reader more readily to compr hend and contrast the results of the different analyses, we have arranged th as displayed in the accompanying tables, pp. 632, 633.

From the examination of these Tables of Analyses it appears —

That the samples of STOUT either obtained from agents, or purchased at taps of several of the principal London porter brewers, were considera stronger than those procured from publicans; the alcohol, of specific gra ·796, temperature 60° Fahr., contained in the former samples ranged from per cent. the highest, to 4·53 the lowest; whereas that of the stouts proc from publicans varied, with one exception, from 4·87 per cent. to 3·25 per ce

That the same difference of strength also characterised the various sam of PORTER procured from the two different sources; the amount of alcohol in porters obtained from the taps varying from 4·51 per cent. to 2·42 per ce whereas those purchased of publicans ranged from 3·97 per cent. to 1·81 cent.

That in nearly all the stouts and porters *salt* was present able amount.

e powder	8 lbs.
h liquorice	½ ,,
olouring	24 galls.

vember 25th — Mrs. Hasler.

lus Indicus	12 lbs.
m	26 ,,
s of paradise	12 ,,
h juice	30 ,,
e powder	3 ,,

Penalty, 200*l*.

-From Mr. Stevenson, an old ant to Dunn and Waller, brewers' gists.

lus Indicus extract	6 lbs.
m	560 ,,
um	88 ,,
ras	310 ,,
ia	150 ,,
ring and drugs	84 ,,

Mixed drugs	240 lbs.
Spanish liquorice	420 ,,
Hartshorn shavings	77 ,,
Liquorice powder	177 ,,
Orange powder	126 ,,
Caraway seeds	100 ,,
Ginger	110 ,,
Ginger root	176 ,,

Condemned, not being claimed.

August 6th — Mr. Gray.

Multum	4 lbs.
Spanish liquorice	21 ,,
Liquorice root powder	113 ,,
Ginger	116 ,,
Honey	11 ,,

Penalty, 300*l*. and costs, including mixing strong beer with table, and paying table-beer duty for strong beer, &c.

r practices had recourse to were, mixing strong beer with table beer, ing mild beer into old by adding sulphuric acid or oil of vitriol; and on er hand, of turning old beer into mild by the addition of carbonate of otash, or oyster-shell powder. Mr. Child, in his treatise "On Brewing," for the conversion of mild beer into old, the use of oil of vitriol.

e articles enumerated as being employed in the adulteration of beer and many are nearly harmless; while others, as cocculus Indicus, copperas, and strychnine, are highly deleterious.

interesting and important to notice, that no case of adulteration has en proved against any of our great London brewers.

ill next describe, very briefly, the method to be pursued in the analysis r.

oint of the porter, either by measure or weight, as may be determined hould be first taken.

specific gravity of this should be ascertained, and then its acidity, by of a solution of dried carbonate of soda of known strength. The porter next be submitted to distillation, using about 5000 grains. It is ne- that the acetic acid of the porter should be neutralised previous to ion, otherwise it will pass over with the spirit, and so affect its quantity cific gravity. It is also advisable that fully two-thirds of the liquid be off, otherwise some of the spirit will remain behind. It is easy to e oneself that this is really the case, either by distilling three separate the same porter, taking off different quantities, or by removing the of the distillation of the same sample at three different periods, when ill, in most cases, be found to be present in the last as well as in the tion of liquid which comes over, although of course in greatly diminished

ier portion of the porter, say 3500 grains, should next be taken, and the l sugar in this determined in the following manner: —

um, together with other matters, should be precipitated by subacetate the sugar remains in solution. The fluid part, after subsidence, is to rated from the solid: this is best effected by decantation, and the ad- the precipitate of small quantities of distilled water. After separation, in each is to be got rid of by means of sulphuretted hydrogen. We w obtained two clear liquids, the one holding chiefly gum in solution, other sugar.

are next carefully evaporated — the sugar over a water bath, until it o lose weight — the gum until it becomes nearly solid, when it should ed with a little alcohol, and dried and weighed. Finally, both the sugar gum should be incinerated, and the ash deducted.

TABLE I.

RESULTS OF THE CHEMICAL ANALYSES OF SAMPLES OF STOUT AND PO
AS OBTAINED EITHER DIRECTLY FROM BREWERIES, OR AS PURCHASED AT THE DIFFERENT LONDON BREWERS.

Contents of Imperial Gallon, 70,000 *Grains*, BY WEIGHT.

Number.	Name.	Specific Gravity.	Alcohol, Specific Gravity 0·796.	Per-centage of Alcohol.	Acidity. Quantity of dried Carbonate of Soda.	Sugar.	Gum.	Ex-tractive.	Ash of Ex-tractive.	
			Grains.		*Grains.*	*Grains*	*Grains.*	*Grains.*	*Grains.*	
	STOUT.									
	FROM BREWERY.									
1	Messrs. Druce & Sons, George-street, Chelsea.	1·016	4097·4	5·83	504·0	2248·0	1047·2	4270·0	145·6	Contains quanti
	FROM TAPS.									
2	Meux & Co., G. Chantry, 267. Tottenham-court-road.	1·031	3661·1	5·23	358·4	3206·8	651·8	5724·4	95·2	
3	Reid & Co., J. Dye, 5. Liquorpond-street.	1·027	3517·1	5·02	504·0	3229·8	1298·0	6163·4	190·4	Contains
4	Combe, Delafield, & Co., M. Davis, 11. Queen-street, Seven-dials.	1·017	3418·1	4·88	526·4		357·4	4189·8	193·4	Contains
5	Truman & Hanbury, A. Johnston, 63. Brick-lane, Spitalfields.	1·022	3342·7	4·77	470·4	3139·0	490·0	5588·1	123·2	Contain
6	Barclay & Perkins, C. Sutton, Park-street, Southwark.	1·026	3616·0	5·16	501·0	2017·4	929·6	5784·8	128·8	Contain
7	Whitbread & Co., H. Wilson, 49. Chiswell-street.	1·024	3172·9	4·53	464·8	2285·0	1271·2	5712·0	140·0	Cont mar
	FROM BOTTLER.									
8	Guinness & Sons.	1·018	3247·2	4·64	537·6	2965·3	633·3	3892·7	160·8	
9	Ditto.	1·018	5009·5	7·15	554·4	2466·0	536·3	4663·0	140·6	
10	Ditto.	1·015	3535·4	5·05	601·8	3206·7	265·1		128·8	
	PORTER.									
	FROM BREWERY.									
11	Reid & Co., Liquorpond-street, No. 1.	1·014	2763·3	3·94	358·0	2132·3	432·2	3701·6	179·2	Contain quan
12	Reid & Co., Liquorpond-street, No 2.	1·013	3161·4	4·51	392·0	2580·5	446·3	3701·6	120·4	Contai muc
13	Truman & Hanbury, Brick-lane, Spitalfields, No. 1.	1·015	2752·8	3·93	415·0	2584·7	443·6	3598·4	184·8	Conta muc
14	Ditto. Ditto, No. 2.	1·014	2926·1	4·18	347·2	2358·5	530·2	3936·8	181·8	Conta mu
	FROM TAPS.									
15	Messrs. Druce & Sons, George-street, Chelsea.	1·009	2506·6	3·58	280·0	1644·8	317·0	2735·5	140·0	Contai quan
16	Meux & Co., G. Chantry, 267. Tottenham-court-road.	1·017	3068·7	4·38	459·2	2293·0	248·0	3551·2	106·8	Conta smal of s
17	Reid & Co., J. Dye, 5 Liquorpond-street.	1·014	2620·9	3·74	408·8	2028·6	692·1	2959·3	100·8	Conta
18	Combe, Delafield, & Co., M. Davis, 11. Queen-street, Seven-dials.	1·011	2293·8	3·27	532·0	1626·3	358·9	3040·7	152·7	Contai qua
19	Truman & Hanbury, A. Johnston, 63. Brick-lane, Spitalfields.	1·018	2735·9	3·95	539·0	2613·0	268·9	3817·0	89·6	Conta qua
20	Barclay & Perkins, C. Sutton, Park-street, Southwark.	1·013			324·8	1962·6	161·3	3139·0	56·0	Conta sal
21	Whitbread & Co., H. Wilson, 49. Chiswell-street.	1·012	1699·2	2·42	392·0	2041·8	363·3	3240·8	145·6	Conta

*** The differences indicated in the Table would have been much more considerable and obvi quantities by MEASURE of the Stouts and Porters been taken, in place of by Weight.

at in some of the samples *cane sugar* and *treacle* was likewise present.

re is reason to believe that the variation of strength would have been still considerable had the samples been procured direct from the several ries, instead of, as in most cases, from the brewers' taps.

s diminution of strength in the beer purchased of publicans is only to be ctorily explained by the addition in many cases of water, this addition no doubt sometimes practised by the publicans and other retailers of malt rs.

e addition of water constitutes the principal, but not the only, adulteration ich these beverages are subjected.

us the addition of water reduces the strength, flavour, and colour, to such tent as to necessitate in some cases the further adulteration of the beer, this is usually effected by means of a very coarse description of brown r, containing much treacle, and known as *Foots*, and salt.

nce the use of cane sugar is permitted in the brewery, we did not attempt certain which of the samples subjected to analysis contained that substance, use, had we found it in any of the samples, we should still have been unable we declared whether the brewers or the publicans were the parties who use of it. We believe, however, that the brewers do not often employ r, since it is alleged that beer made with any considerable proportion of sugar does not keep so well as that prepared from malt only. Moreover, rice of sugar forms an obstacle to its use in breweries.

ppears, from the analyses, that salt is almost constantly present in porter. addition we know is made in the first instance by the brewers themselves; here is also no doubt that a further quantity of it is frequently used by the can to assist in bringing up the flavour of beer which has been reduced in gth by the addition of water. The quantity of salt contained in porter is sufficiently large to communicate a perceptibly saline taste to the mouth. alt is used by the brewers in the following manner:— It is first mixed up ub with some kind of flour—usually wheat-flour—and the mixture is cast ndfuls over the surface of the wort in the cooling vat. It is said to assist e preservation and fining of the wort, and it is alleged that these are the purposes for which it is employed by the brewer.

e three usual and principal adulterations of porter consist, then, of water, ich its strength is reduced and its bulk increased, and sugar and salt, by its colour and flavour are in a measure restored. But there is good n for believing, from evidence given before the recent Committee of the e of Commons, of which Mr. Villiers was the chairman, that other adulons are practised, and that sulphuric acid, or oil of vitriol, salt of steel, lphate of iron, and cocculus Indicus, are likewise not unfrequently used, his both by the publican and brewer.

t only is the fact of the addition of water proved by the present analyses, vidence of another character has been supplied by different parties to the mittee above referred to, showing the same fact. In particular, it has been d that a publican could not afford to sell porter at the price which he pays , in the state in which it is supplied to him by the brewers, and realise a t upon it, unless he had recourse to adulteration.

e acidity of porter, as will be seen by referring to the analyses, is very derable, and this is no doubt the reason why in some cases the beverage rees with the stomach, and occasions heartburn.

e acidity is very far from being due to acetic acid alone; for if this be led off, the remaining stout or porter, as the case may be, will still be l to be very acid; the acidity, where sulphuric acid has not been used, ding upon the presence of some fixed vegetable acid or acids, and most bly the malic and lactic acids, the presence of which would explain why liquors, including porter, are unsuited to all cases in which a tendency exists umatism or gout. The large quantity of acid, and also sugar, contained ter and other malt beverages, render them also unfit for nearly all cases ich any disposition to diabetes is manifested. The difference in the ity of acetic and fixed acids in any sample of porter may be thus deter- l:—A weighed or measured quantity of the porter should be taken, and nount of a solution of either caustic soda or dried carbonate of soda of known strength required to neutralise it ascertained; a similar quantity of th same porter should then be submitted to distillation, and the acidity of t residue determined; the difference in the amount of soda required in each ca shows the quantity of fixed and volatile acids present.

In one respect the analyses above given may be considered to be satisfac-tory, inasmuch as they show that sulphate of iron is not usually contained i London draught stouts or porters, nor in most bottled porters; if used at al, as it no doubt sometimes is, it is in the inferior bottled porters that it wil be found. From experiments which we have made, we have ascertained th when sulphate of iron is present in porter, in so small a proportion as tw grains to a nine-gallon cask, the well burned ash of the extract of the porte will be found to be more or less coloured with the red oxide of iron. This is a very delicate means of determining the presence of iron in porter extract and if iron in the above small quantity be found in it, there will be ever reason for suspecting that sulphate of iron has been added to the beer; for th ash of genuine porter extract is never in the slightest degree coloured, but i always, when well freed from carbonaceous matter, either white or greyish white.

We should also state that we made full analyses of two samples of fining obtained from different brewers, and found that they consisted entirely of wea and very sour beer, holding, dissolved, a considerable quantity of a descriptio of isinglass, which was readily precipitated by a decoction of oak bark.

The remedy by which the adulteration of malt liquors may be met appears t us to be clear and simple, and it is one to which we recently had the opportun of directing the attention of the Committee of the House of Commons on Publi houses; it is, *that no malt liquors should be permitted to be sold by any publica under certain fixed or standard strengths*, the tests of strength being not th specific gravity of the beers, but principally the amount or per-centage of alcoh contained in them.

Such a regulation, properly enforced, would effectually put a stop to th adulteration of malt liquors, by the addition of water, sugar, salt, and the oth substances mentioned in the present report; and it need not in any way interfe with the different recognised strengths and qualities of malt liquors now in us as single and double stouts, ales, and porters.

GIN, AND ITS ADULTERATIONS.

Gin was made originally in Holland, in the distilleries of Schiedam, an hence that which is brought to this country is termed Hollands Gin. At on time, when the duty was low, it used to be largely imported, but owing to th high rate of duty levied upon it for some years past, which was, until 1846, £1 2*s*. 10*d*. per imperial gallon, and since that period has remained at 15*s*.,— but little now reaches this country.

In Holland it is made solely from unmalted rye and barley-malt, rectifie with juniper berries. In Britain, gin is for the most part obtained from mixture of malt and barley, molasses and corn being sometimes employed, par-ticularly when there is a scarcity of grain, and it is usually flavoured not onl with juniper berries, but with certain other substances, most of which ar aromatics, and amongst which are the following: coriander, cardamom, an caraway seeds, grains of paradise, angelica root, calamus root, crushed almond cake, liquorice powder, and orange-peel. These ingredients, variously com-bined, form what are known in the trade as "gin-flavouring."

In Dr. Muspratt's "Chemistry, Theoretical, Practical, and following receipts from the note-book of an extensive distil given.

TABLE II.

TS OF THE CHEMICAL ANALYSES OF SAMPLES OF STOUT AND PORTER,

AS PURCHASED OF PUBLICANS RESIDENT IN LONDON.

Contents of Imperial Gallon, 70,000 *Grains*, BY WEIGHT.

Name.	Specific Gravity.	Alcohol, Specific Gravity, 0·796.	Per-centage of Alcohol.	Acidity. Quantity of dried Carbonate of Soda.	Sugar.	Gum.	Extractive.	Ash of Extractive.	
		Grains.		*Grains.*	*Grains.*	*Grains.*	*Grains.*	*Grains.*	
STOUT.									
PUBLICANS.									
ts, 1. Glasshouse- Regent-street	1·022	3400·7	4·87	274·4		461·5	4801·4	186·0	Contains salt.
, 227. Piccadilly	1·014	3208·2	4·58	285·6	3089·1	90·0	4160·1	196·0	Contains salt.
Blockey, 80. Jer- reet	1·019	3137·6	4·48	209·0	3628·5	468·2	4181·4	128·8	Contains rather much salt.
6. Oxford-street	1·017	4365·8	6·21	268·8	2656·4	1084·3	4833·3	168·0	Contains a little salt.
, 12. Marylebone Regent-street	1·030	2947·4	4·21	352·8	4313·3	702·0	6294·3	168·0	Contains much salt.
ell, 7. Beak-street, -square	1·017	3185·3	4·55	376·3		914·1	4746·3	34·8	Contains salt.
man, 287. Oxford-	1·025	3326·7	4·75	278·3	3760·2		6290·0	163·4	Contains salt.
ond, 248. Oxford-	1·019	2314·6	3·35	205·3	3396·7	481·2	5065·2	212·8	Contains salt.
tout	1·012	2661·5	3·89	285·6	1609·1	438·6	2674·9	67·2	
n, (in bottle) 7. treet, Bloomsbury	1·015	2232·2	3·19	716·8	1695·6	588·2	3397·5	134·4	Contains salt.
Muffitt, (in bottle, " Findlater, & Co.,") Cathe- eet, Strand	1·010	2276·7	3·25				3687·7		
ORTER.									
PUBLICANS.									
, 9. Brewer-street, -square	1·010	1878·8	2·68	296·8	1224·1	449·9	2331·3	145·6	Contains much salt.
chinson, 19. Little y-street, Golden-	1·017	2633·6	2·90	358·4	2115·1	587·9	2879·6	84·0	Contains salt.
e, 100. Berwick- Soho	1·016	2190·0	3·12	408·8	2019·0	102·6	4150·4	95·2	Contains salt.
ll, 16. High-road, bridge	1·014	2075·7	2·96	476·0	1556·9	836·1	3903·[illegible]	235·2	Contains much salt.
rd, Holborn-hill	1·019	2211·6	3·15	347·2	2002·2	211·7	2834·1	128·8	Contains much salt.
l, 28. High-row, bridge	1·012	1650·8	2·35	476·0	1736·7	591·0	3141·4	218·4	Contains much salt.
rd, 22. Berwick- Soho	1·015	2369·0	3·38	375·2	1691·4	576·5	3084·9	145·6	Contains salt.
Young & Co., ming's-row	1·010	1869·6	2·67	352·8	2259·2	614·0	3593·4	218·4	Contains salt.
rth, 167. Oxford-	1·017	1323·9	1·89	369·6	1756·[illegible]	551·8	371·[illegible]	151·2	Contains salt.
y, 7. Little New- eet, Soho	1·014	2059·6	2·94	504·0	2070·5	559·8	3231·0	184·8	Contains much salt.
Coates & Co., 25. hapel High-street	1·018	20[illegible]9·3	2·98	436·8	2635·4	993·3	4428·0	123·2	Contains rather much salt.
, 48. Gerrard-st.,	1·016	1716·8	2·45	420·0	1560·0	445·8	2828·[illegible]	173·6	Contains rather much salt.
n, 242. High Hol-	1·014	268[illegible]·9	3·83	358·4	1745·7	691·2	3808·0	140·0	Contains a little salt.
tock, 1. White- High-street	1·013	1993·7	2·84	364·0	[illegible]186·[illegible]	867·0	2373·5	295·0	Contains salt.
r, 3. Cable-street, se-square	1·009	2201·9	3·14	459·2	1241·2	551·8	2055·0	134·4	Contains salt.
n, Whitechapel reet	1·015	1902·4	2·71	425·6	2571·1	359·3		151·2	
, 5. Edgware-road	1·012	2033·6	2·90	347·2	1690·1	620·0	3164·0	162·4	Contains a little salt.
77. Leman-street, hapel	1·011	2098·6	2·99	408·8	1718·3	1178·5	4317·4	263·2	Contains salt.
25, Cable-street, se-square	1·014	1267·5	1·81	403·2	1942·4	991·[illegible]	3460·1	190·4	Contains mr salt.
porter	1·012	2780·1	3·97	369·6	2154·9	542·4	3712·8	72·8	

[illegible] OF GIN.

[illegible] great [illegible]ity. Accum, on the adulteration o [illegible] usual, meet with much valuable and [illegible] gin as retailed," states Accum,* "w [illegible] pretty prevalent amongst dealers, t [illegible] and to sweeten it with sugar. This [illegible] a quantity of the liquor in a table [illegible] thus be rendered obvious, in th [illegible] spirit is volatilised.

[illegible] genuine gin, as obtained from th [illegible] by fraudulent retailers into [illegible] water, and twenty-six pounds o [illegible] a turbidness, because the oil o [illegible] which the spirit holds in solutio [illegible] and thus cause the liquor to assum [illegible] weakened cannot readily be render [illegible] are had recourse to to clar [illegible] of which are harmless, oth [illegible] sonous.

[illegible] consists in adding to the weaken [illegible] water, and then a solution of s [illegible] together, and left undisturbed f [illegible] thus produced from the alum [illegible] strainer upon the milky liqu [illegible] matter which produces the b [illegible] alum is also employed, with [illegible] liquors."

[illegible] — "Another method of fining spirituous liqu [illegible] of sub-acetate of lead, and then [illegible] dangerous, because part of the s [illegible] the liquor, which it thus rend [illegible] clarifying spirituous liquors, I ha [illegible] practised than the preceding metho [illegible] imparts to the liquor a fine *comp* [illegible] vestiges of lead may often be detec [illegible]

"[illegible] with sugar, and, to cover the [illegible] is given to it with grains of paradis [illegible] and other acrid and aromatic substances."— [illegible]

[illegible] Spirituous Liquors and their Adulterations," Mitch [illegible] writes — "Spirituous liquids, as brandy, rum, gin, &c., being unfortunately such common in use, and bearing so high a price, are peculiarly adapted for the purposes of adulteration, which may be of various kinds; the most general, how[illegible] ever, is the addition of water. Were this the only adulteration practised [illegible] would be rather productive of good than harm, for obvious reasons; yet in reality, it has the very opposite effect; for in order to disguise the dilution [illegible] is necessary to add some substance, capable, by its pungency or other simila[illegible] property, of completely counteracting the addition of water; such substanc[illegible] are capsicum, Guinea pepper, oil of turpentine, &c., all of which, when tak[illegible] in combination with spirit, affect the stomach very injuriously." †

Again, at page 144, Mr. Mitchell remarks — "Gin is usually adulterate[illegible] with water in considerable quantity; sugar is also added, and a mixture, co[illegible] posed of alum, carbonate of potash, almond oil, sulphuric acid, and spirits [illegible] wine; this compound not only fines the gin, but communicates to it the pro[illegible] perty of 'beading,' or hanging in pearly drops or beads on the sides of the gla[illegible] containing it. When gin does this, it is generally supposed to be strong i[illegible] proportion as it beads, and the above mixture communicates to weak gin th[illegible]

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* Treatise, page 265

† On the Falsificat[illegible] p. 140.

Fine Gin, take

960 gallons of spirit, hydrometer proof.
96 lbs. German juniper berries
6 lbs. coriander seeds.
4 lbs. grains of paradise.
4 lbs. angelica root.
2 lbs. orris root.
2 lbs. calamus root.
2 lbs. orange peel.

r ninety pounds of liquorice powder are occasionally added to impart
sweetness.

London Gin is made as follows: —

700 gallons of the second rectification.
70 lbs. German juniper berries.
70 lbs. coriander seeds.
3½ lbs. almond cake.
1¼ lbs. angelica root.
6 lbs. liquorice powder.

manufacture of *West Country Gin*, the annexed is the process given
spratt's work: — Introduce into the still 700 gallons of the second
n, and flavour with —

14 lbs. German juniper berries,
1½ lb. calamus root, cut, and
8 lbs. sulphuric acid.

is much used in Cornwall, and particularly in the western counties
d; it is also used in making British Hollands, and in that case is
h about five per cent. of fine gin, reduced to twenty-two under-proof
r. Our own examination of this variety of gin, usually called Ply-
n, tends to show that it is little else than a moderately pure rectified
weetened, containing fusel oil, and flavoured with a little juniper and
r.

neva, charge of still being 950 gallons of second rectification, the
s are —

84 lbs. juniper berries.
112 lbs. coriander seeds.
6 lbs. cassia buds.
4 lbs. angelica root.
6 lbs. calamus root.
6 lbs. almond cake.
½ lb. cardamoms.

eneva. — For 950 gallons of spirit of second rectification, take —

84 lbs. juniper berries.
84 lbs. coriander seeds.
2 lbs. almond cake.
2 lbs. orris root.
2 lbs. calamus.

r prescription for making Geneva, and one which is much esteemed,
owing: — Add to 950 gallons —

14 lbs. grey salts, and
4 lbs. white salts.

tification to be conducted with the usual care.

second operation, add —

168 lbs. juniper berries.
74 lbs. coriander seeds.
12 lbs. almond cake.
8 lbs. grains of paradise.
8 lbs. angelica root.
1 lb. cardamoms.
2 lbs. calamus."

half a gallon of lime-water, one gallon of rose water: mix the whole in eithe a pail or cask, with a stick, till every particle shall be dissolved; then add t the foregoing twenty-five pounds of sugar dissolved in about nine gallo of rain or Thames water, or water that has been boiled: mix the whole w together, and stir them carefully with a stick in the 133 gallon cask.

"To *force down* the same, take and boil eight ounces of alum in three quarts of water for three quarters of an hour; take it from the fire, and dissolve b degrees six or seven ounces of salt of tartar. When the same is milk-warm, pour it into your gin, and stir it well together as before, for five minutes, th same as you would a butt of beer newly fined. Let your cask stand as yo mean to draw it. At every time you propose to sweeten again, that cask mus be well washed out, and take great care never to shake your cask while it i drawing."

But it appears there are other little practices, beside those connected wi adulteration, which are sometimes had recourse to by retailers of spirits. M Shannon, from whose work "On Brewing and Distilling" we have just quote gives the following advice and recommendations as to certain manipulations an particulars which should be observed in retailing spirits over the counter.

"When you are to draw a sample of goods to show a person that has judg ment in the proof, do not draw your goods into a phial to be tasted, or mak experiment of the strength thereof that way, because the proof will not bo except the goods be exceedingly strong; but draw the pattern of goods eith into the glass from the cock, to run very small, or rather draw off a sma quantity into a little pewter pot, and pour it into your glass, extending yo pot as high above the glass as you can without wasting it, which makes t goods carry a better head abundantly, than if the same goods were to be p and tried in a phial.

"You must be so prudent as to make a distinction of the persons you ha to deal with; what goods you sell to gentlemen for their own use who requi a great deal of attendance, and as much for time of payment, you must take considerably greater price than of others; what goods you sell to persons whe you believe there is a manifest, or at least some hazard of your money, you ma safely sell for more than common profit; what goods you sell to the poor, esp cially medicinally, (as many of your goods are sanative,) be as compassiona as the cases require."

Method of Estimating the Quantity of Alcohol present in any Spirituous Liquid.

There are several methods by which the amount of alcohol contained in an spirituous liquid may be determined with greater or less accuracy. One of th readiest of these means is to ascertain the specific gravity of the spirit by specific-gravity instrument for liquids. Of these instruments, many differen kinds have been invented, with scales adapted to the range of the liquids fo the determination of the density of which they have been constructed: thus w have urinometers, saccharometers, hydrometers, alcoholometers, &c.; but th principle on which these instruments are constructed is alike in all cases.

The instrument in general use for determining the specific gravity of spiri tuous liquids in this country is what is known as Sykes' hydrometer. It differs however, from the ordinary hydrometer in the division of its scale, and also i the use of weights. The hydrometer is calculated to show the strength in spiri either above or below a certain fixed standard, denominated "proof." Th stem of the instrument is graduated and subdivided, so as to meet the extreme of variation in the strength of the liquors examined by it.

Sykes' hydrometer is the instrument mostly used by the Excise, by brewers distillers, and publicans.

Since the specific gravity of a spirituous liquid is subject to great variation at different temperatures, it is necessary that the temperature of the spirit a the time of taking its weight should be noted, and corrections made for this by means of certain tables which have been constructed for the purpose. Th temperature at which the specific gravity of the spirit is referred as the standar is usually 60° Fahrenheit.

The specific gravity test for determining the amount of alcohol present i erty, so that it will be evident gin can be considerably diluted with water, yet, by the addition of the above, appear of its proper strength."

ı the detection of the adulterations of gin with capsicum, cherry-laurel r, &c., Mr. Mitchell makes the following observations: —

Detection of Capsicum, &c. — If the spirit suspected to contain capsicum, ea-pepper, or grains of paradise be evaporated to dryness in a water-bath, esidual matter will, if the sample had been adulterated, taste of the above- tioned substances, and in proportion to the quantity present.

Detection of Cherry-laurel Water, or *Spirit of Almond-cake.* — Take a ion of the suspected spirit, and distil it nearly to dryness; add to the distilled d a slight excess of caustic potash, and evaporate until the bulk of the d is considerably diminished. Divide the evaporated liquid into two equal ions; to the one add a few drops of a solution, obtained by dissolving proto- hate of iron (green vitriol) in water, and exposing the so-made solution to ction of the air for a short time, (ten or twelve hours,) and a few drops of ution of potash. If, now, a little hydrochloric acid be added, and the liquid ires a blue tinge, the spirit under examination has been falsified with ry-laurel water, or spirit of almond-cake.

The *rationale* of the above process is as follows: — Both cherry-laurel water spirit of bitter almond-cake contain hydrocyanic (prussic) acid. When t thus adulterated is distilled, hydrocyanic acid passes over with the spirit, on the addition of caustic potash is converted into cyanide of potassium. then concentrated by evaporation, and the addition of the salt of iron and ochloric acid causes the formation of prussian blue, which is a certain cation of the presence of hydrocyanic acid, and consequently of cherry- l water, or spirit of almond-cakes.

The following process can be performed on the other half of the liquid. method has been lately described by Liebig, and is far more sensitive than above, so that smaller quantities of the substances in question can be cted.

Hydrochloric acid in slight excess must be added to the reserved portion e liquid, and then a drop of sulphide of ammonium added, and the whole ed until colourless. If, now, a little perchloride of iron be added, a blood- coloration will immediately ensue. This depends on sulpho-cyanide of onium being formed by the reaction of sulphide of ammonium on hydro- ic acid, which strikes a blood-red colour with a persalt of iron, in common all the soluble sulpho-cyanides."

Shannon's work, "On Brewing and Distilling," we meet with the following uctions for reducing unsweetened gin, and for preparing and sweetening sh gin: —

"*To Reduce Unsweetened Gin.*

"A tun of fine gin - - - - -	252 gallons.
Water - - - - - -	36 „
Which, added together, make - - -	288 „
The *Doctor is now put on*, and it is further reduced with water - - - -	19 „
Which gives - - - -	307 gallons of gin."

This done, let one pound of alum be just covered with water, and dissolved oiling; rummage the whole well together, and pour in the alum, and the e will be fine in a few hours.

To Prepare and Sweeten British Gin. — Get from your distiller an empty heon or cask, which will contain about 133 gallons. Then take a cask of rectified spirits — 120 gallons — of the usual strength as rectifiers sell their s at; put the 120 gallons of spirits into your empty cask.

Then take a quarter of an ounce of oil of vitriol, half an ounce of oil of nds, a quarter of an ounce of oil of turpentine, one ounce of oil of juniper ies, half a pint of spirit of wine, and half a pound of lump sugar. Beat or the above in a mortar. When well rubbed together, have ready prepared to be examined, should, in all cases, separate the alcohol by distillatio determine its amount from the distilled liquid, and this is the method by we have proceeded in the determination of the alcohol contained in the sa of gin the results of the analyses of which we are about to make known. exact steps adopted were as follows : —

The temperature of the several spirits was reduced in all cases, by mea a solution of ice and salt, to one uniform degree — viz., 60° Fahr., an specific gravity at that temperature determined by means of the specific gr bottle; 1500 grains by measure were next distilled, and the distillation ca nearly to dryness; the distilled liquor was brought to 60° Fahr., weig and its specific gravity again taken. These particulars being determined, per-centage of alcohol was ascertained by the following alcoholmetrical t of Tralles : —

ALCOHOLMETRICAL TABLE OF TRALLES.

Alcohol* in 100 Measures of Spirit.	Specific Gravity at 60 Fahr.	Difference of the Specific Gravity.	Alcohol in 100 Measures of Spirit.	Specific Gravity at 60° Fahr.	Difference of the Specific Gravity.
0	9·991	—	51	9·315	20
1	9·976	15	52	9·295	20
2	9·961	15	53	9·275	20
3	9·947	14	54	9·254	21
4	9·933	14	55	9·234	20
5	9·919	14	56	9·213	21
6	9·906	13	57	9·192	21
7	9·893	13	58	9·170	22
8	9·881	12	59	9·148	22
9	9·869	12	60	9·126	22
10	9·857	12	61	9·104	22
11	9·845	12	62	9·082	22
12	9·834	11	63	9·059	23
13	9·823	11	64	9·036	23
14	9·812	11	65	9·013	23
15	9·802	10	66	8·989	24
16	9·791	11	67	8·965	24
17	9·781	10	68	8·941	24
18	9·771	10	69	8·917	24
19	9·761	10	70	8·892	25
20	9·751	10	71	8·867	25
21	9·741	10	72	8·842	25
22	9·731	10	73	8·817	25
23	9·720	11	74	8·791	26
24	9·710	10	75	8·765	26
25	9·700	10	76	8·739	26
26	9·689	11	77	8·712	27
27	9·679	10	78	8·685	27
28	9·668	11	79	8·658	27
29	9·657	11	80	8·631	27
30	9·646	11	81	8·603	28
31	9·634	12	82	8·575	28
32	9·622	12	83	8·547	28
33	9·609	13	84	8·518	29
34	9·596	13	85	8·488	30
35	9·583	13	86	8·458	30
36	9·570	13	87	8·428	30
37	9·556	14	88	8·397	31
38	9·541	15	89	8·365	32
39	9·526	15	90	8·332	33
40	9·510	16	91	8·299	33
41	9·494	16	92	8·265	34
42	9·478	16	93	8·230	35
43	9·461	17	94	8·194	36
44	9·444	17	95	8·157	37
45	9·427	17	96	8·118	39
46	9·409	18	97	8·077	41
47	9·391	18	98	8·034	43
48	9·373	18	99	7·988	46
49	9·354	19	100	7·939	49
50	9·335	19			

* Anhydrous Alcohol of specific gravity 7·939.

The third column of this table exhibits the difference of which give the denominator of the fraction for su sufficiently near in the table, and the difference greatest to the density found in the table; for

applicable only when they are free from any solid substance, as ex-
sugar, &c., the presence of which, by affecting their weight, of course
s their specific gravity. When, therefore, any liquid contains saccha-
ny other solid matter, it is requisite that the spirit should be separated
ation, and that the specific gravity of the alcohol thus obtained should
. Where strict accuracy is required, it will be necessary to have
to distillation in almost all cases, since there are but few spirits which
ontain more or less solid matter.

siderable improvement on Sykes' hydrometer is the instrument invented
ay Lussac many years since, called the centesimal alcoholometer. This
nt, when immersed in any spirituous liquid at the temperature of 15°
de, equal to 59° Fahr., at once indicates the quantity of alcohol by
present. As its name implies, the stem is divided into a hundred parts
es, and is so contrived that each degree represents one hundredth part
rous or pure alcohol; thus the point at which it floats, when immersed
pirit at a certain temperature, indicates exactly the per-centage of abso-
hol contained in that spirit. The great value of this instrument is, that
at once the per-centage of alcohol, all subsequent calculations, with the
me involved, and the possibility of inaccuracies, being thereby avoided.

er instrument, constructed on a totally different principle to the ordi-
simeters, is the ebullioscope or ebullition alcoholometer. This instru-
based upon the fact that the boiling point of spirituous liquids varies
g to the amount of alcohol contained in them, (a discovery made by
é Brossard-Vidal, of Toulon,) without its being essentially modified,
other instruments, by the presence and nature of any solid ingredients
ay be contained in them.

are several forms of this instrument; there is the original one of
sard-Vidal, and the modifications by M. Conaty, by MM. Lerebours
etan, and by Dr. Ure.

nercurial thermometer used in the modification of the instrument by
rebours and Secretan is graduated centesimally in degrees, which cor-
to those of the centesimal alcoholometer of M. Gay Lussac, and its
lunged in the liquid to be proved. The liquid is carefully heated by
f a spirit lamp, the flame of which should not be strong, lest it occasion
apid ebullition of the spirit. Before using the instrument, it is neces-
letermine the boiling point of pure water, and the barometrical pressure
mosphere on the day on which the experiments are made.

. Ure's modification of the instrument, the scale is adapted to that of
ydrometer.

ld be of the greatest possible advantage — would save immense time
ble — if densimeters of all kinds were revised, and were reduced to one
centesimal scale, as is done, in fact, in many of the instruments in use
ontinent.

bullioscope is probably sufficiently accurate in the results which it
s as to be of considerable service to the distiller, the rectifier, the wine-
and the brewer; but is certainly not so where strict accuracy is re-

re's modification of the ebullioscope, together with a full description of
iples and application, may be obtained of Mr. Joseph Young, Little
treet.

er instrument which has been invented for the determination of the
on of alcohol in spirituous liquids is the alcoholometric dilatometer of
rmann. By this instrument, the amount of spirit is determined by the
of the spirituous liquid at various temperatures.

more accurate method of determining the quantity of alcohol contained
uous liquids from their specific gravity, is by means of the specific-
bottle. In using this, the same precaution with regard to temperature
presence of any solid substance in the spirit must be observed.

dinary purposes, in the hands of manufacturers and dealers, of all the
nts for determining the strength of spirituous liquors, the centesim
meter of M. Gay Lussac is the safest and best, and, next to that, Syk
ter. But the chemist, when any solid matter is contained in the li

On the Detection of Sulphate of Zinc in Gin.

The [illegible] and its weight determined, is to be re-diss [illegible] Half of the solution is to be tested with acid nitrate of ba [illegible] and the other half treated with sulphuretted hydroge [illegible] which means the zinc will be thrown down as a white hydrated sulphuret, [illegible] which, if sufficient of the spirit be used, the metal itself may be separated. [illegible] the detection of this salt, because it is very prob [illegible] that it is sometimes used to clarify adulterated gin.

On the Presence of Sulphates in Gin.

The addition of acid nitrate of baryta to gin, which has not been adultera with water, would not result in any precipitation of sulphates, because [illegible] the spirit is all distilled. When, therefore, on the additi of this baryta reagent, a precipitate is thrown down, this is due either to [illegible] presence of [illegible] sulphuric acid: if the latter, and there be [illegible] the sulphates are derived either from the w [illegible] of the spirit, or from the alum employed for clarifying [illegible] alum being absent the presence of sulphates afford [illegible] of the adulteration of gin with water.

[illegible] samples of gin to which the baryta test was added, four tur [illegible] deposition of sulphate occurred: whil [illegible] and in three a considerable precipita [illegible] the residues dissolved in a little disti water, [illegible] two parts: to one the acid nitrate baryta [illegible] sulphate of baryta was thrown down in ev [illegible] Through the other half of the solu [illegible] was passed; in not one instance was any white precipi [illegible] absence of zinc is to be inferred. These observati [illegible] affording us the means of judging of the adultera of gin by the addition of water. Heretofore the presence of water has b [illegible] from the deficiency of alcohol in the spirit suppo [illegible]

On the Presence of Lead in Gin.

As [illegible] stated that acetate of lead is employed in [illegible] in order, therefore, to ascertain whether [illegible] found in gin, eight ounces of ten differ [illegible] the residues dissolved in a little distilled water, [illegible] passed through them: in one case a decided brow [illegible] some of the others slighter discolorations were [illegible] was lead discovered in the ashes treated w [illegible] tested with iodide of potassium. If lead was, the [illegible] samples, it was so only in traces.

The absence of lead may be explained in some cases even where it has rea been used. The lead of the acetate would combine with the sulphates of t water, and the insoluble sulphate of lead would be precipitated: it is, therefo only when the quantity of lead added is in excess of the sulphates that it wou be found in gin; and when sulphates are present in gin, we may safely conclu that it does not contain lead.

From the following Table of Analysis it appears,—

1st. That the strength of the various samples ranged from 15.645 grs. [illegible] 34.[illegible] grs. per imperial gallon; the per-centages ranging from 22·35 [illegible] per cent.

It thus appears, that some of the spirits contained only half as much a [illegible] as was present in some of the other samples, and therefore that the commercial value was reduced to the enormous extent of more than one hal thus, supposing sample 2. to be worth 12s. per gallon, sample 35. would worth less than 6s. per gallon. This variation in the strength of the spirits doubtless principally attributable to dilution with water.

quor found for 60° Fahr. = 9·605, (the per-centage will be between 33 and
he difference from 9·609 (which is the next greatest number in the table) = 4,
he fraction is $\frac{4}{13}$, therefore the true per-centage is $33\frac{4}{13}$, or, decimally, thus,
. In order to ascertain the amount, by volume, of alcohol in the gin or
spirit under examination, it is necessary to proceed as follows:—In order
d the per-centage of absolute alcohol of 7·939 specific gravity in a sample of
, divide the number of grains distilled over by the specific gravity of the
led spirit. Multiply this quotient by the per-centage according to Tralles,
livide this sum by the bulk of the original sample taken; the quotient is
er-centage. This per-centage multiplied by 700 gives the number of grains
solute alcohol by volume in the gallon. The above comprise all the cal-
ions necessary for arriving at this result. The following is a statement of
everal sums:—

1500 gr. by volume yield 1334·6 gr. by weight; sp. gr. ·9484;
per-centage, 41·62
The bulk of the distilled spirit is obtained by
As ·9484 : 1· :: 1334·6 : A
The volume of absolute alcohol obtained by
As 100· : A :: 41·67 : B
The per-centage by volumes in the sample by
As 1500 : B :: 100· : C = 39·09
To find the quantity of absolute alcohol in a gallon,
As 100· C : 700· D
the quantity required.

om the construction of Tralles' table, the per-centage of alcohol by weight
lso be found—for instance, multiply the number representing the volumes
ohol given in the table for any determinate specific gravity of the mixture
e specific gravity of the pure alcohol—that is, by 7·939, and the product
number of pounds of alcohol in so many pounds, as the specific gravity
plied by 100 gives. Thus, in the mixture, 9·510 specific gravity, there
0 measures of alcohol; hence there are also in 95·100 lbs. of this spirit
+ 40 = 31·756 lbs. of alcohol; and in 100 lbs. of the spirit of 0·9510 spe-
ravity 33·39 lbs. of alcohol are contained.

Method of Determining the Amount of Sugar in Gin.

s is readily determined in either of the two following ways:—The syrupy
contained in the retort after distillation should be removed and evapo-
with a gentle heat, until the water has been driven off, and the sugar
llised. Or a fresh weighed portion of the gin may be evaporated in the
manner, and the weight of the sugar furnished by it ascertained. The
is the more accurate method, because the heat employed in distilling off
irit not unfrequently modifies the sugar considerably, so that in all cases
not crystallise properly.

od of Detecting the Presence of Capsicum, Grains of Paradise, and other fixed Acrid Substances in Gin.

e presence of these may usually be ascertained by simply tasting a portion
e syrupy extract left after distillation. The acrid principle of capsicum is
d one, and no part of it passes over during distillation. Of the two acrid
iples contained in grains of paradise, one is volatile, and the other fixed.
aste of the fixed principle very closely resembles that of Cayenne pepper,
ay be usually distinguished with a little care. The plant which furnishes
uetta pepper, or grains of paradise, is the *Amomum Grana Paradisi.*

On the Detection of Cinnamon or Cassia in Gin.

the flavour of these depends upon the presence of essential oils, they of
readily pass off during distillation, and the extract, therefore, does not
y furnish any evidence characteristic of their presence. For the purpose
ecting these oils, the spirit should be gently evaporated, and at such a
rature as does not occasion the volatilisation of the oils.

TABLE SHOWING THE RESULTS OF THE CHEMICAL ANAL
DISTILLE

Number.	Name.	Address.
1	Messrs. Bowerbank & Sons	77½ Sun-street, Bishopsgate-street
2	Messrs. J. & J. Vickers & Co.	Stoney-street, Borough
3	Messrs. Hodges & Co.	Church-street, Lambeth
4	J. Bell	25. Cable-street, Whitechapel
5	Rose & Mathews	4. Wells-street, Whitechapel
6	R. Skipper	Cable-street
7	W. Coates & Co.	25. High-street, Whitechapel
8	D. Morton	2. Whitechapel-road
9	F. Junge	66. Cable-street
10	J. Hancock	11. Somerset-place, Aldgate
11	J. Brown	30. High-street, Whitechapel
12	W. Freshwater	Back-church-lane, Whitechapel
13	J. Williams	45. High-street, Whitechapel
14	J. Brand	77. Leman-street, Whitechapel
15	J. Colliss	King-street, Smithfield
16	M. Chance	69. Long-lane, Smithfield
17	J. Champion	33½. Grays Inn-lane
18	G. Stockdell	78. Gray's Inn-road
19	J. Young	72. High Holborn
20	J. Denyer	15. High-street, St. Giles'
21	W. Latimer	47. Broad-street, St. Giles'
22	R. Sinclair	36. High-street, St. Giles'
23	H. Cusack	6. Tottenham-court-road
24	W. Cripps	1. Newport-market
25	W. Tillyard	19. Moor-street, Soho
26	W. Moss	Seven-dials
27	G. A. Compton	84. Edgware-road
28	Walker & Co.	63. Westminster-bridge-road
29	C. Watchorn	1. Marsh-gate, Lambeth
30	J. Empson	107. Lambeth-marsh
31	T. Grammar	Waterloo-road
32	W. Jorden	52. Tothill-street, Westminster
33	W. Carpenter	11. King-street, Westminster
34	W. Vickress	11. Bridge-street, Westminster
35	H. Rennell	High-road, Knightsbridge
36	W. Weatherley	Knightsbridge
37	J. Upton	Hemming's-row, Charing-cross
38	T. West	9. Bear-street, Leicester-square

Y-EIGHT SAMPLES OF LONDON GIN AS OBTAINED FROM CANS.

Amount of Anhydrous Alcohol, Sp. Gr. 793·9, Temp. 60 Fahr. per Gallon by Volume.	Per-centage of Alcohol, Sp. Gr. 793·9 by Volume.	Sugar per Gallon.			Remarks.
		oz.	dr.	gr.	
28336	40·48	None.			
34160	48·80	None.			
33740	48·20	5	7	35	
17969	25·67	4	5	31	Contains the Oil either of Cinnamon or Cassia.
28448	40·64	5	3	12	
25452	36·36	5	0	52	
28497	40·71	7	6	48	
27349	39·07	6	4	5	Contains tincture of Capsicum or Cayenne; residue after distillation pungent to the taste.
23758	33·94	5	5	15	Contains a considerable quantity of Cayenne.
27160	38·8	4	3	30	
27377	39·11	5	6	0	Extract bitter; contains much combined Sulphate, most probably derived from the water used.
24143	34·49	4	7	14	Contains a large quantity of Cayenne; residue hot and fiery.
25354	36·22	5	3	35	Contains a considerable quantity of the Oil of either Cinnamon or Cassia; extract bitter, contains combined Sulphate.
24374	34·82	6	2	5	
23730	33·90	6	5	43	Contains a large quantity of Cayenne; residue very fiery.
25571	36·53	8	2	48	
22806	32·58	5	2	16	
17850	25·5	5	3	32	
23163	33·09	6	1	59	
25004	35·72	4	1	56	
24395	34·85	4	6	36	
28868	41·24	13	4	13	
27321	39·03	5	6	51	
24339	34·77	5	2	25	
22715	32·45	4	5	3	
28987	41·41	5	3	33	
27405	39·15	6	6	25	
28000	40·00	9	3	42	
29197	41·71	6	6	22	
24724	35·32	5	0	10	
28959	41·37	7	9	8	
16828	24·04	3	4	23	Contains Cayenne in rather large amount.
27033	37·19	7	2	0	
29071	41·53	8	0	23	
15645	22·35	6	0	35	Contains a large quantity of Cayenne; residue intensely fiery.
22414	32·02	4	1	52	Contains a large quantity of Cayenne; residue very hot.
22106	31·58	5	2	16	
25102	35·86	5	4	36	

nearly the same smell as an alcoholic solution of cyanogen, as any chemi
discover by standing near the discharge-pipe of the refrigeratory wor
raw-grain whisky still. Such spirits intoxicate more strongly than pure
of the same strength, and excite, in many persons, even temporary fren
is a volatile fatty matter, of a very fetid odour, when obtained by itsel
have procured it in cold weather at some of the great distillers in Scotlan
does not combine with bases. At the end of a few months, it spontan
decomposes in the spirits, and leaves them in a less nauseous and noxious
By largely diluting the spirits with water, and distilling at a moderate te
ture, the greater part of this oil may be separated. Part of it comes over
the strongest alcohol, and part with the latter runnings, which are called b
distillers strong and weak feints. The intermediate portion is purer s
The feints are always more or less opalescent; or become so on dilution
water, and then throw up an oily pellicle upon their surface. The charco
light wood, such as pine or willow, well calcined, and infused in sufficient q
tity with the spirits prior to rectification, will deprive them of the greate
of that oily contamination. Animal charcoal, well calcined, has also been f
useful; but it must be macerated for some time with the empyreumatic s
before distillation. Another method of separating that offensive oil is to a
the impure spirits with a quantity of fat oil, such as olive oil, or oil of alm
to decant off the oil, and re-distil the spirits with a little water.

"Digestion and agitation with calcined magnesia for some time, follow
filtration and distillation, are also good means for improving the flavo
alcohol. The taste of the oil of grains is best recognized by agitation
water, whereby, on standing, the diluted spirit throws up a film of oil v
by reflected light. If the spirit be mixed with a few drops of nitrate of s
and exposed for some time to sunshine, the oil will react upon the ox
silver, and cause a brown tinge; but if there be no oil present, the spirit
remain limpid. If one part of hydrate of potash, dissolved in a little w
be mixed with 150 parts of spirits, and if the mixture be well shaken,
slowly evaporated down to 15 parts, and mixed with 15 parts of dilute sulp
acid in a phial, to be then corked, there will soon exhale from the mixtu
peculiar offensive odour characteristic of the quality and origin of the im
spirit, whether obtained from raw grain, from malt, from potatoes, rye, an
rum, brandy, &c. This excellent process may be used also for testing w
Lime and alkalis always injure the flavour of ardent spirits of all kinds."

Heavy duties are levied upon all descriptions of spirits according to
strength. The specific gravity or strength of spirits of the legal standa
the Excise is technically called *Proof*, or *Proof Spirit*. "This liquor not b
spirit sweetened, or having any ingredient dissolved in it to defeat the stre
thereof, at the temperature of 51° Fahr. weighs exactly $\frac{12}{13}$th parts of an e
measure of distilled water;" and with this standard the strength of all
spirits are compared according to law. The duty on British spirits is 7*s.*
Scottish, 5*s.* 8*d.*, and Irish, 3*s.* 4*d.* per proof gallon.

The following are some of the enactments relating to the trade in spirits

"No spirits made in England, Scotland, or Ireland, shall be conveyed
England to Scotland or Ireland, or from Scotland or Ireland to England,
wise than in casks containing *twenty* gallons at the least, and in vessels
less than *fifty* tons burden.

"All persons whatsoever, not being licensed distillers, rectifiers, or
pounders, having more than *twenty* gallons of spirits in their possession,
be deemed dealers in spirits, and subject to the survey of the officers of E
and to all the regulations, penalties, &c., to which such persons are li
(16 Geo. 4. c. 80. § 122.)

"Dealers in British spirits are prohibited selling or having in their poss
any plain British spirits, except spirits of wine, of any strength exceedi
strength of 25 per cent. above hydrometer, or of any strength below
cent. under hydrometer proof, or any compounded spirits, except shrub,
greater strength than 17 per cent. under hydrometer, under
all such spirits with the casks," &c.—§ 124.

"Dealers in foreign and British spirits are to ke

-EIGHT SAMPLES OF LONDON GIN AS OBTAINED FROM ANS.

Amount of An- ydrous Alcohol, Sp. Gr. 793·9, Temp. 60 Fahr. per Gallon by Volume.	Per-centage of Alcohol, Sp. Gr. 793·9 by Volume.	Sugar per Gallon.			Remarks.
		oz.	dr.	gr.	
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25571	36·53	8	2	48	
22806	32·58	5	2	16	
17850	25·5	5	3	32	
23163	33·09	6	1	59	
25004	35·72	4	1	56	
24395	34·85	4	6	36	
28868	41·24	13	4	13	
27321	39·03	5	6	51	
24339	34·77	5	2	25	
22715	32·45	4	5	3	
28987	41·41	5	3	33	
27405	39·15	6	6	25	
28000	40·00	9	3	42	
29197	41·71	6	6	22	
24724	35·32	5	0	10	
28959	41·37	7	9	8	
16828	24·04	3	4	23	Contains Cayenne in rather large amount.
27033	37·19	7	2	0	
29071	41·53	8	0	23	
15645	22·35	6	0	35	Contains a large quantity of Cayenne; residue intensely fiery.
22414	32·02	4	1	52	Contains a large quantity of Cayenne; residue very hot.
22106	31·58	5	2	16	
25102	35·86	5	4	36	

FLOUR, AND ITS ADULTERATIONS.

"This Wilson carries on an extensive business at the Old Mill, Lan
hill, Heaton Norris; and he has been summoned before the Stockport b
magistrates. The superintendent of the borough police deposed that he s
the premises of the defendant, and found a sack of mineral white, or h
sulphate of lime; and the defendant's son told him that all the flour th
tained the mineral was sent away that morning: he found other sacks
China clay, which the defendants said had been bought to mix with flo
was found to be of too soft and oily a nature. John Eaton, a man w
been in the defendant's employment, swore that he had been employed
the mineral white with flour in the proportion of one sack of mineral to t
flour. About the end of September, some wheat belonging to Mr.
Marsland, which had been sent to this mill to be ground, was treated i
way, and a portion of the genuine flour kept back. Witness had also tak
sacks of flour to Mr. Hayes, a provision dealer, and with this he had
mineral white by defendant's orders. A great portion of it was afterwar
turned, having been found so bad that it could not be used. Mr. Wheel
the defence, admitted the nature of the ingredients found on the defen
premises; and called Mr. W. O. Wilson, defendant's son and manager, t
that the wheat ground was of an inferior description; and that the flo
manufactured for sizing and oiling purposes only. The mineral whi
used to improve the colour; but the only flour defendant ever sold for
consumption, was the two sacks to Hayes, and neither these nor those bel
to Mr. Marsland contained a particle of mineral. Mrs. Hayes had req
them as a favour to send her the flour, which she thought would do for
bread; but as it was found not to answer the purpose required, a porti
sent back. The witness Eaton had threatened to make them repent it w
was discharged. Witness was not aware that the mineral white would
machinery. This remarkably lame defence, it would seem, was atte
listened to by the bench of magistrates, who, after consulting for som
decided that the defendant had no right to have such ingredients on h
mises; but as they believed that Wilson was not aware that he was
contrary to law, they would inflict the mitigated penalty of 5*l.* and costs
counsel for the defendant gave notice of appeal at the next Quarter S
but of course there will be no appeal. This "ignorant" man, with so
a knowledge of the law, as not to know that he was infringing it, we
has wit enough to let the matter drop, and put up with the loss of his
costs. If he had his deserts, he ought now to be the inmate of a
Dispatch, 3rd Dec. 1854.

ADULTERATION OF TOBACCO.

Bow-street.—"Edward Arthur Welch, tobacco manufacturer of
street, Clerkenwell, was summoned at the instance of the Excise, on a
of adulterating tobacco, and having a quantity of treacle in his pos
Mr. Dwelly, solicitor to the Board, produced witnesses, and he showed
of the tobacco, stating that the mixture of treacle was in the proportion o
5 per cent.; the object of which was to increase the weight of the articl
defendant pleaded guilty to the articles being found in his possession,
the tobacco was adulterated as found before it came to his house. Mr.
urged strongly the infliction of the full penalties, as it had been ascertain
within a short period, the defendant had purchased two tons of treacle fr
sugar-refiners of London; and supposing this quantity to be used with
for adulteration, it would entail a loss upon the revenue of 1,200*l.*,
nothing of the extent to which the public would be defrauded by the san
cess. Mr. Henry inflicted the full penalty of 300*l.* for the first offen
200*l.* for the second; a distress warrant to issue in the event of non-pa
The defendant said he should petition the Board for a reduction of penal
Observer, Dec. 10. 1854.

s, or other places specially entered for that purpose, under a heavy penalty; any person mixing, selling, or sending out any British spirits mixed with gn or colonial spirits, shall forfeit 100*l.* for every such offence." — § 126.

No retailer of spirits, or any other person, licensed or unlicensed, shall sell end out from his stock or custody any quantity of spirits exceeding one on, unless the same be accompanied with a true and lawful permit, under a of forfeiting 200*l.*; and any rectifier, compounder, or dealer in spirits iving the same into their stock, or allowing any one else to receive it, and carrier, boatman, or other person knowingly carrying the same, shall for- the sum of 200*l.* with the boat, horse, cart, &c., used in the carriage,"— § 116.

No licence to be granted for retailing spirits within gaols, houses of cor- ion, or workhouses for parish poor; nor are spirits to be used there, ex- medicinally prescribed by a regular physician, surgeon, or apothecary. alty for a first offence of this sort committed by gaolers, &c., 100*l.*; a ond offence to be deemed a forfeiture of their office,"— § 134.

Persons *hawking spirits* to forfeit them and 100*l.*; and if the penalty be immediately paid, they are to be committed to the House of Correction for e months, or until paid,"— § 138. "Any person is authorised to detain a ker of spirits, and give notice to a peace-officer, who is to carry the nder before a Justice."— § 140.

Any officer of Excise, or other person employed in the Excise, taking any of money or reward from, or entering into any collusive agreement with, person, to act contrary to his duty, to forfeit 500*l.* and be incapacitated; any person offering such reward, or proposing such agreement, to forfeit *l.*" — § 145.

he high price of alcohol in this country, in consequence of the heavy duties hich it is subject, and the low price in other countries, where it is nearly y free, has led to its contraband importation under various disguises. Some- es it is mixed with oil of turpentine, from which it can be sufficiently freed ectification for the purpose of the gin manufacturer. Sometimes it is dis- sed by wood naphtha and wood vinegar — from the latter of which it may eparated by distillation in a water bath — but from the former the separation more difficult, as alcohol and wood spirit are nearly equally volatile. It has been disguised with coal naphtha, but from this it may be easily separated istillation, on account of the great difference of the boiling point of the ids; besides, coal naphtha will not combine with water as alcohol does.

he following directions are given by Ure for discovering whether wood it contains alcohol: — "Add to the suspected liquid a little nitric acid of g. 1·45. If alcohol be present, in even small proportion, an effervescence ensue, from the evolution of etherised nitrous gas, with its characteristic rous smell. On treating the mixture with a nitrous solution of mercury, a the process for fulminate of mercury, an effervescence will take place, the e vapour of etherised mercurial gas will appear, and a certain proportion ulminate will be formed, corresponding pretty closely to the proportion of hol in the wood naphtha mixture."*

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* Ure's Dictionary, 4th Edition, vol. i. p. 31.

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49. *Section* V.—

150 Fossils, characteristic of particular Formations, viz.:—

Pliocene Group. Diodonta fragilis, Laganum alternatum.—*Miocene Group.* Leuciscus papyraceus, Squalus cornubicus, Cypræa affinis, Pyrula rusticula, Cancellaria acutangula, Buccinum reticulatum, Fusus Burdigalensis, Cerithium margaritaceum, cinctum, inconstans, and plicatum, Chenopus pespelecani, Trochus patulus, Cyclostoma bisulcatum, Paludina multiformis, Litorinella acuta, Calyptræa difformis, Cyrena subarata , Corbula revoluta, Astarte Omalii, Cardita Jouanneti, Arca diluvii, Pectunculus polyodonta, Astrea Ellisiana, Quercus Göeppertii.—*Eocene Group.* Ancillaria buccinoidea, Rostellaria fissurella, Fusus bulbiformis, Cerithium cristatum and echinoides, Turritella imbricataria, Ampullaria Willemetii, Natica depressa, Melania lactea, Nucula Deshayesi, Thecocyathus sinuosus, Nummulites-ataticus. — *Chalk.* Belemnites mucronatus, Pholadomya Esmarkii, Inoceramus Cripsii, Ostr. vesicularis.—*Upper Green-sand.* Corax heterodon, Cardium hillanum, Spondylus spinosus, Gryphæa columba, Terebrat. nerviensis, Spatangus coranguinum, Scyphia furcata.—*Gault.* Ammonit. varicosus and Beudanti, Cirrus depressus, Inoceramus concentricus. —*Neocomien.* Belemnites dilatatus, Ammon. cassida, Terebrat. semistriata, Toxaster complanatus. — *Weald Clay.* Paludina fluviorum, Cyrena Heysii.—*Upper Oolite.* Leptolepis sprattiformis, Ammon. polygyratus, Diceras minor, Terebratula lacunosa, Cidaris coronata, Pentacrinus pentagonalis, Thecosmilia trichotoma, Stylina limbata.—*Middle Oolite.*

Zinc Blende, Calamine, Silicate of Zinc, Willemite;—Native Bismuth, Sulphuret of Bismuth;—Oxide of Antimony, Sulphuret of Antimony, Arsenical Antimony, Native Arsenic, Realgar, Orpiment, Native Mercury, Cinnabar;—Minium, Galena, Selenuret of Lead, Boulangerite, Carbonate of Lead, Sulphate of Lead, Chromate of Lead, Phosphate of Lead;—Foliated Tellurium;—Cerite, Orthite;—Tantalite, Yttrotantalite;—Rutile, Titanite;—Tungstate of Lime;—Molybdenite, Molybdate of Lead;—Pyrolusite, Hausmanite, Braunite, Manganite Psilomelane, Silicate of Manganese;—Native Silver, Amalgam, Vitreous Sulphuret of Silver, Brittle Sulphuret of Silver, Red Silver, Chloride of Silver;—Native Gold;—Native Platinum;—Osmium-Iridium. Size 2 inches by 2, 3*l.*; 3 inches by 3, 5*l.*

56. CABINETS OF MINERALS FOR YOUTHS in fine pasteboard cases 9*s.* to 25*s.*

58. Collections of Gems in their natural state, 50 species and varieties . 3*l.*

A COLLECTION OF GLASS MODELS OF GEMS, to illustrate—

60. *Section* I.—The crystalline forms and colours of the principal Gems; viz. Diamond, Sapphire, Ruby, Chrysoberyl, Spinnelle, Emerald, Topaz, Garnet, Amethyst, Chrysolite, Zircon, Tourmaline. Size, 1 inch by ½ inch, 2*l.* 12*s.* 6*d.*

61. *Section* II.—The principal forms into which gems are cut, viz. Lasque, Rose, Single Cut, Brilliant, Lisbon, en Cabochon . . . 2*l.* 2*s.*

62. *Section* III.—The gems in their cut state . . . 2*l.* 12*s.* 6*d.*

63. Portable Lapidary's Apparatus for cutting and polishing Minerals, &c., complete, with the necessary materials and directions for use 7*l.* 7*s.*, 8*l.* 8*s.*, 10*l.* 10*s.*

PALÆONTOLOGY.

COLLECTIONS OF SPECIAL CLASSES OF FOSSILS.

	Species and Var.	A. 10	B. 25	C. 50	D. 100	E. 150	F. 200	G. 300	H. 500
		s.	£. s.	£. s.	£. s.	£. s.	£. s.	£. s.	£.
78.	Plants, fruits, &c. .	5	0 12	1 10	3 10	5 15	8 0	14 0	..
79.	Infusoria	5	..	..	..	..	..	..	..
80.	Zoophytes . . .	5	0 12	1 10	3 15	6 10	..	..	..
81.	Echinodermata . .	10	1 10	4 0	..	..	..	..	..
82.	Mollusca . . .	5	0 12	1 5	2 12	4 0	6 0	10 0	20
83.	Cephalopoda . .	6	0 15	1 15	4 0	6 10	9 0	15 0	..
84.	Articulata . . .	10	1 5	3 0	6 10	12 0	..	..	..
85.	Trilobites . . .	10	1 5	2 15	6 0	..	..	..	..
86.	Fishes	15	1 15	4 0	..	..	..	..	..
87.	Reptilian remains .	15	2 0	..	..	..	..	..	..
88.	Mammalian remains	10	1 5	..	..	..	..	..	..

Grey Manganese. 88. Red Copper Ore. 89. Native Silver. 90. Native Copper. 91. Iron Pyrites. 92. Mispickel. 93. Smaltine. 94. Copper Pyrites. 95. Galena. 96. Molybdenite. 97. Grey Antimony. 98. Zincblende. 99. Sulphur. 100. Asphalt.

Size, 2 inches by 2 inches, 1*l*. 5*s*.—3 inches by 3 inches, 2*l*.

52. 100 Rocks, same as collection 48.

53. 100 Fossils, viz.:—
No. 1-4. From Alluvium and Diluvium Deposits. 5-28. From the Tertiary Formation. 29-48. From the Chalk and Greensand. 49-70. From the Jura and Lias. 71-80. From the Trias. 81-90. From the Permian and Carboniferous. 91-100. From the Devonian and Silurian. 1*l*. 16*s*.

54. EMIGRANT'S COLLECTION, comprising 111 Specimens of those Minerals and Rocks most worthy of notice in Foreign Countries, either for their own value or for their *indications* of Mineral Wealth.

Rocks.—Granite, coarse and fine grained, Syenite, Hornblende Rock, Porphyre, Basalt, Greenstone, Serpentine, Trachyte, Obsidian, Lava, Quartz Rock, Itacolumite, Puddingstone.—*Slates, &c.*: Mica Schist, Gneiss, Chlorite Slate, Clay Slate, Silurian and Devonian Slate, Coal Shale, with fossil plants, Lias Shale, Lithographic Slate.—*Sandstones:* Ferruginous, Calcareous, pure Sandstone.—*Limestones;* Metamorphic Limestone; Silurian and Devonian, with Trilobites, &c.; Magnesian and Carboniferous Limestone with Spirifers and Productus; Lias and Oolitic Limestone; Chalk, white and black; Tertiary Limestone with fossils; Fresh-water Limestone; Travertine. —*Clays:* Blue Clay, Pipe-clay, Marl or Fullers' Earth, Porcelain Clay.

Minerals.—*Minerals at times mistaken for Gold:* Yellow Mica, Crystals of Iron, and Copper Pyrites.—*Ores:* N. Gold; N. Silver, Sulphuret of Silver; Amalgam, N. Mercury, Cinnabar; Platinum; N. Copper, Oxide of Copper, Blue and Green Carb. of Copper, Massive Copper Pyrites, Gray Copper; Oxide of Iron, red and brown, Magnetic Oxide of Iron, Ironstone, Carb. of Iron, Massive Iron Pyrites; Galena, Carb. of Lead; Zinc Blende, Calamine; Oxide of Zinc. Tin Pyrites; Copper Nickel, Native Arsenic, Realgar, Orpiment; Oxide of Manganese, Arsenical Cobalt; Native Bismuth.—*Useful Minerals:* Sulphur; Graphite; Anthracite, Coal, Brown Coal; Feldspar; Talc; Mica; Alumstone; Gypsum; Salt; Iceland Spar; Emery; Strontianite; Barytes; Amber; Asbestus; Fluor Spar; Dolomite.—*Gems:* Rock Crystal; Beryl; Topaz; Sapphire; Ruby; Hyacinth; Garnet; Tourmaline; Turquois; Zircon; Chrysolite; Idokras.

Size, 1 inch square, 16*s*.; 4 in. sq. 1*l*. 10*s*.

55. METALLURGICAL COLLECTION, comprising 110 specimens of the principal Minerals used for the extraction of the most important Metals, viz.

Meteoric Iron, Magnetic Iron Ore, Specular Iron, Iron Mica, Red Hæmatite, fibrous and compact, Brown Hæmatite, fibrous and compact, Lepidokrokite, Stilpnosiderite, Clay Ironstone, Bog Iron Ore, Blue Iron Ore, Iron Pyrites, White Iron Pyrites, Magnetic Iron Pyrites, Arsenical Pyrites, Arsenical Iron, Carbonate of Iron, Sphaerosiderite, Lievrite, Titaniferous Iron, Franklinite, Crome Iron Ore, Tunsgate of Iron;—Native Copper, Red Oxide of Copper, Black Oxide of Copper, Sulphate of Copper, Bournonite, Purple Copper, Copper Pyrites, Grey Copper, Blue Carbonate of Copper, Malachite, Arseniate of Copper, Silicate of Copper;—Smaltine, Black Oxide of Cobalt, Arseniate of Cobalt;—Copper Nickel, Nickel Pyrites, Green Oxide of Nickel;—Oxide of Tin, Wood Tin, Tin Pyrites;—Red Oxide of Zinc,

Zinc Blende. Calamine, Silicate of Zinc, Willemite;—Native Bismuth, Sulphuret of Bismuth;—Oxide of Antimony, Sulphuret of Antimony, Arsenical Antimony, Native Arsenic, Realgar, Orpiment, Native Mercury, Cinnabar;—Minium, Galena, Selenuret of Lead, Boulangerite, Carbonate of Lead, Sulphate of Lead, Chromate of Lead. Phosphate of Lead;—Foliated Tellurium;—Cerite, Orthite;—Tantalite, Yttrotantalite;—Rutile, Titanite:—Tungstate of Lime;—Molybdenite, Molybdate of Lead;—Pyrolusite. Hausmanite. Braunite. Manganite Psilomelane, Silicate of Manganese;—Native Silver, Amalgam, Vitreous Sulphuret of Silver, Brittle Sulphuret of Silver. Red Silver, Chloride of Silver;—Native Gold;—Native Platinum;—Osmium-Iridium. Size 2 inches by 2, 3*l.*; 3 inches by 3, 5*l.*

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PALÆONTOLOGY.

COLLECTIONS OF SPECIAL CLASSES OF FOSSILS.

	Species and Var.	A. 10	B. 25	C. 50	D. 100	E. 150	F. 200	G. 300	H. 500
		s.	£. *s.*	£. *s.*	£. *s.*	£. *s.*	£. *s.*	£. *s.*	£.
78.	Plants, fruits, &c. .	5	0 12	1 10	3 10	5 15	8 0	14 0	..
79.	Infusoria	5	..	..	..	..	..	..	..
80.	Zoophytes . . .	5	0 12	1 10	3 15	6 10	..	..	..
81.	Echinodermata . .	10	1 10	4 0	..	..	..	..	..
82.	Mollusca . . .	5	0 12	1 5	2 12	4 0	6 0	10 0	20
83.	Cephalopoda . .	6	0 15	1 15	4 0	6 10	9 0	15 0	..
84.	Articulata . . .	10	1 5	3 0	6 10	12 0	..	..	..
85.	Trilobites . . .	10	1 5	2 15	6 0	..	..	..	..
86.	Fishes	15	1 15	4 0	..	..	..	..	..
87.	Reptilian remains .	15	2 0	..	..	..	..	..	..
88.	Mammalian remains	10	1 5	..	..	..	..	..	..

COLLECTIONS OF FOSSILS FROM THE DIFFERENT FORMATIONS.

	Species.	L. 25	M. 50	N. 100	O. 150	P. 200	Q. 300	R. 400	S. 1000
		s.	£. s.	£. s.	£. s.	£. s.	£.	£. s.	£.
89.	Alluvium and Diluvium .	10	1 5	. .	. .	. .	. .	. .	. .
90.	Tertiary . .	10	1 0	2 5	3 15	5 15	10	14 0	40
91.	Cretaceous .	10	1 0	2 10	4 0	6 0	10	13 10	. .
92.	Wealden . .	15	2 0	. .	. .	. .	. .	. .	. .
93.	Oolite . .	10	1 0	2 5	3 15	5 15	10	14 0	45
94.	Lias . . .	10	1 0	2 10	4 0	6 0	10	. .	
95.	Trias . . .	15	2 0	4 15	8 0	12 10	. .	. .	. .
96.	Permian . .	15	2 0	5 10	. .	. .	. .	. .	. .
97.	Carboniferous	10	1 0	2 5	4 0	6 0	. .	. .	. .
98.	Devonian .	10	1 5	3 0	5 5	8 0	14	20	. .
99.	Silurian . .	12	1 5	3 0	5 10	9 0	15	22	. .

CASTS OF RARE FOSSILS.

Persons wishing to purchase these Casts can be furnished with two engravings representing most of them.

		£. s. d.
150. Mastodon giganteum, Pl. II. fig. 6.		
	Lower jaw perfect, 2¼ feet long, from the diluvium of the Missouri River	1 5 0
	The original is in the Royal Museum at Berlin.	
151. Megalonyx Jeffersoni, Harlan.		
	Four different bones; femurs, phalanges, &c., from the same locality	0 6 0
152. Gulo spelaeus, Goldfuss.		
	A perfect head; from the Gailenreuth caves . . .	0 5 0
	The original in the Museum of Bonn.	
153. Elephas primigenius, Blumenbach.		
	Perfect lower jaws, with teeth, of a young animal; from the River Lippe, Westphalia	0 7 6
	The original in the Museum of Bonn.	
154. Zeuglodon hydrachos, Carus.		
	The most perfect head ever found, 3 feet in length, skull and lower jaws well preserved; from the Eocene beds of Alabama.	1 10 0
	The original in Dr. Krantz's Museum.	
155. Zeuglodon cetoïdes, Owen; Basilosaurus Harlani; Hydrarchos, Koch.		
	Two teeth, from the Eocene group of Alabama . . .	0 3 0
156. Sphærulites calceoloides, Desmoulins.		
	Figured in Part IV. of the Mém. de la Société de France .	0 8 0
	The original belonging to Dr. Krantz.	
157. Iguanodon, Hylæosaurus and Gavial.		
	Fourteen different bones, from the Weald clay of Sussex, England	1 0 0
	The originals are in the British Museum.	
158. Pterodactylus crassirostris, Goldf., Pl. II., fig. 7.		
	Two pieces from the lithographic slate of Bavaria . .	0 12 0
	The original is in the Museum of Bonn.	
159. Mystryosaurus longipes, Pl. II., fig. 5.		
	Perfect skeleton from the Wurtemberg Lias . . .	1 16 0
	The original is in the Imperial Museum at Vienna.	

		£.	s.	d.
160.	Mystryosaurus, species. Pl. II., fig. 8. Head of a small-sized specimen from the same place . .	0	6	0
	The original is in the Royal Museum at Berlin.			
161.	Ichthyosaurus platyodon. Pl. II., fig. 2. Perfect head of a skeleton 60 feet long	1	10	0
162.	Perfect fin of the same specimen. Pl. II., fig. 3 . . .	0	18	0
163.	Ichthyosaurus intermedius. Pl. II., fig. 4. Head, thorax, and fins perfect	1	10	0
164.	Ichthyosaurus tenuirostris. Pl. II., fig. 9. Perfect head	0	5	0
	Originals of Nos. 13–15 in Dr. Krantz's Museum.			
165.	Ichthyosaurus communis. Pl. II., fig. 1. Fin perfect 12-16. Wurtemberg lias	0	3	0
	The original is in the Imperial Museum at Vienna.			
166.	Plesiosaurus dolichodeirus, Conyb. Pl. I., fig. 2. Skeleton, perfect, 6 feet long, from the Lias slates of Glastonbury in Somersetshire	4	4	0
	The original is in the British Museum.			
167.	Pelagosaurus, new species. Pl. II., fig. 14. Head, perfect, from Boll, Wurtemberg	0	4	0
	The original in Dr. Krantz's Museum.			
168.	Pentacrinus subangularis. Pl. II., fig. 1. The best known specimen; stem 7 feet long; same locality .	1	0	0
	The original in Dr. Krantz's Museum.			
169.	Labyrinthodon. Pl. I., fig. 3. Head, perfect, from the Keuper coal beds at Gaildorf in Wurtemberg	1	10	0
	The original in the Museum at Stuttgart.			
170.	Pistosaurus longævus, H. von Meyer. Pl. II., fig. 12. Head, from the Muschelkalk at Bayreuth, Bavaria . .	0	4	0
	The original in the Royal Museum at Berlin.			
171.	Nothosaurus mirabilis, Munster. Perfect upper head; from the Muschelkalk of Bayreuth . .	0	6	0
	The original in Dr. Krantz's Museum.			
172.	Placodus rostratus, Munster. Head, from the Muschelkalk of Bayreuth	0	8	0
	The original in Dr. Krantz's Museum.			
173.	Protorosaurus Speneri. Pl. II., fig. 11. Vertebral spine and extremities, from the cupriferous slate of Rothenburg	0	5	0
	The original in the Royal Museum at Berlin.			
174.	Archegosaurus Decheni, Goldfuss. Head from the coal measures of Saarbrück	0	2	6
	The original in Mr. Von Dechen's Collection.			
175.	Several species of Trilobites, remarkable for rareness or beauty, such as represented in Pl. II., figs. 13 and 14, each piece .	0	1	0

NOTICE.

As Mr. Highley has as yet been unable to obtain a fixed rate of conveyance between Bonn and England, he is obliged, as far as minerals, &c., are concerned, to divide the expense of carriage, &c., between the various parcels, according to their size, forwarded in each packing case.

Those desirous of making additions to these collections are referred to Dr. Krantz's 'Rheinisches Mineralien Comptoir Catalogue of Mineralogical, Geological, and Palæontological Specimens, Collections, Models, &c.,' price 1s., whose List of *Minerals* contains now about 1000 species collected at more than 3000 localities, and forming a Stock of about 500,000 choice Specimens, unrivalled by any known private collection, and representing the state of the Science at the very latest date, with its most recent discoveries. From the extensive nature of his establishment, Dr. Krantz is enabled to offer specimens *on very moderate terms*, the difference in price depending chiefly on the locality, size, or beauty.

Of Rock Specimens about 1000 varieties are in stock, constituting a complete series of all the primary, volcanic, and sedimentary rocks which form the known solid part of our globe. All the Specimens of each Collection are of the same size and shape, so as to admit of being arranged in an elegant manner, without unnecessary waste of room in drawers or cases. Each Specimen is accompanied by a printed ticket, with the English, French, and German names and localities. The Prices vary according to the size of the Specimens, viz.:—Three inches square 3*d*. to 9*d*.; four inches square 6*d*. to 1*s*. each.

Of Fossil Organic Remains on hand, the number of species amounts to about 8000, collected from the principal localities of Europe and the United States. All these species are carefully determined. Each specimen is furnished with a printed label indicating the name, geological formation, and locality. The Collections are generally arranged stratagraphically, but zoological classifications are adopted when required; or any special Treatise on Geology, &c., may be illustrated.

⁂ **Collections to illustrate Special Mineralogical Subjects, Processes, Manufactures, &c., may be made up to order.**

BOTANY.

COLLECTIONS, ETC., TO ILLUSTRATE THE PRINCIPLES AND ELEMENTS OF BOTANY *in preparation*.

ECONOMIC BOTANY.

COLLECTIONS TO ILLUSTRATE THE VEGETABLE PRODUCTS USED IN COMMERCE.

In these Collections each specimen is accompanied by a label, giving the commercial name, scientific name, native name, whence imported, uses, statistics of imports.

903. COLLECTION OF SIX NUTS OF COMMERCE, viz.—

Litchis, Souari or Surahwa Nut, Cashew Nut, Pecan Nut, Black Walnut or Hog Nut, Vegetable Ivory or Corosso Nut; in divisional glazed box.

907. COLLECTION OF TWELVE VEGETABLE FIBRES USED FOR TEXTILE FABRICS. viz.—

Dutch Flax, Bombay Flax, Polish Ryne Hemp, White Crown Marienburg Hemp, Bombay Hemp, Italian Garden Hemp, Jute Hemp or Jute, Sun Hemp, Manilla Hemp, Coir Yarn, China Grass, Piassava or Piacaba.

908. COLLECTION OF TEN TANNING MATERIALS, viz.—

Cork-tree Bark or Alcornoque, Valonia Camata (Young-Valonia), Savanilla Divi-Divi, Maracaibo Divi-Divi, Rio de la Hache Divi-Divi, Pi-pi, Bombay Cutch, Terra Japonica, Pegu Cutch.

Malacopterygii Apoda	from 1*l.* 5*s.* to 2*l.* 10*s.*
Lophobranchii	from 1*l.* to 1*l.* 10*s.*
Plectognathi	from 1*l.* to 8*l.*
Chondropterygii Branchiis Fixis	from 1*l.* 10*s.* to 2*l.* 10*s.*

ART—ANATOMY.

MODELS TO ILLUSTRATE THE STUDY OF ANATOMY IN ITS APPLICATION TO ART.

*** *See also Osteology.*

1031. AN ANATOMICAL STATUETTE, exhibiting the External Muscles of the Human Body. Carefully modelled, and expressly adapted for the use of Artists, and others interested in the study of Anatomy. Height, 27 inches. Accompanied by a KEY, containing Outline Views of the Statuette in its several aspects, with reference to the Names of the Muscles . . . . 15*s.*

1032. The same, carefully coloured . . . . . . 1*l.* 10*l.*

*** *Packed in a Case for the Country, 4s. extra.*

1033. Life-size Model, showing the External Muscles of the Head and Neck on one side, and Bones of the Skull on the other; carefully coloured, on stand . . . .

1034. Life-size Model of the External Muscles of the Hand and Arm, coloured; on stand . . . .

1035. Life-size Model of the External Muscles of the Foot and Leg, coloured; on stand . . . .

ANATOMY AND PHYSIOLOGY.

1042. A dissecting model in wax of the human brain, *in situ*, under glass shade . . . . 5*l.* 5*s.*

1043. An enlarged dissecting model in wax of the Medulla oblongata, under glass shade . . . . 3*l.* 3*s.*

CONCHOLOGY.

COLLECTION OF BRITISH SHELLS.

	£.	*s.*	*d.*
100 Species, containing several of each species	2	12	6
200 Ditto	6	6	0
300 Ditto	12	12	0

1017. Os-Innominata, Femur, Patella, Tibia, and Fibula, bones of the Ankle-joint and Foot, articulated with vulcanized India-rubber, in box . . . . 1*l.* 11*s.* 6*d.*

1018. Bones of the Hand and Wrist-joint, articulated with brass wire 5*s.* 0*d.*

1019. Bones of the Hand and Wrist-joint, articulated with cat-gut . . 7*s.* 6*d.*

1020. Bones of the Hand and Wrist-joint, articulated with vulcanized India-rubber, in box . . . . 10*s.* 6*d.*

1021. Bones of the Feet and Ankle-joint, in the various manners and at the same prices as Nos. 1018, 1019, 1020.

⁂ *See also Midwifery and Embryology for Fœtal Skeletons and Pelvis.*

COMPARATIVE OSTEOLOGY.

Articulated Skeletons from the different classes of animals, can generally be supplied, but as the SPECIES depends upon the opportunity of purchase, Curators of Museums, and others, interested in Comparative Anatomy, are requested to intimate the particular species they require, and to forward their names to Mr. S. Highley, that they may be duly informed of every addition to his Collection. The range of prices is given in the annexed list as a guide to Collectors.

MAMMALIA.

Quadrumana	from 1*l.* 16*s.* to 25*l.*
Carnassores	from 12*s.* 6*d.* to 20*l.*
Marsupialia	from 2*l.* 12*s.* 6*d.* to 20*l.*
Rodentia	from 1*l.* 1*s.* to 20*l.*
Edentata	from 9*l.* 9*s.* to 30*l.*
Pachydermata	from 2*l.* 10*s.* to 50*l.*
Ruminantia	from 3*l.* 13*s.* 6*d.* to 20*l.*
Cetacea	from 3*l.* 3*s.* to 30*l.*

AVES.

Accipitres	from 15*s.* to 9*l.* 9*s.*
Passerinæ	from 12*s.* 6*d.* to 15*s.*
Scansores	from 17*s.* 6*d.* to 1*l.*
Gallinæ	from 12*s.* 6*d.* to 2*l.* 11*s.* 6*d.*
Grallæ	from 15*s.* to 30*l.*
Palmipedes	from 1*l.* to 5*l.* 10*s.*

REPTILIA.

Chelonia	from 1*l.* to 3*l.* 3*s.*
Sauria	from 1*l.* 1*s.* to 21*l.*
Ophidia	from 1*l.* 1*s.* to 36*l.* 15*s.*
Bactrachia	from 5*s.* to 3*l.*

PISCES.

Acanthopterygii	from 1*l.* to 5*l.*
Malacopterygii Abdominales	from 1*l.* to 3*l.*
Malacopterygii Subbrachiati	from 1*l.* to 5*l.*

2011. Highley's Hospital Microscope, on Tripod Stand, inclinable body, large double sliding stage with diaphragm, plain and concave mirror, fine and sliding coarse adjustments to body, Huyghenian eye-piece, with adapting-piece for Ross's, Smith and Beck's, or Powell and Lealand's object-glasses . . . . 4*l.* 4*s.*

ₓ (*This instrument combines economy with simplicity, elegance of form, and excellence of workmanship.*)

2012. Highley's Hospital Microscope, with RACKWORK coarse adjustment . . . . 5*l.*

2013. Highley's Hospital Microscope, as above, with RACKWORK MOVEABLE STAGE, &c. . . . . 7*l.* 7*s.*

2014. Upright Mahogany Cabinet, with fittings for Highley's Hospital Microscope . . . for 2011, 16*s.*;—for 2012 and 13, 1*l.* 5*s.*

2015. Achromatic Object-glasses for Highley's Hospital Microscope, in brass boxes.

	Object Glasses.	Magnifying Power, in Diameters.	Magnifying Power with Extra Eye-Piece.	Price.		
				£.	*s.*	*d.*
2016 . .	1-inch	100		1	1	0
2017 . .	¾-inch	170		1	5	0
2018 . .	½-inch	350		1	11	6

2032. Extra Eye-piece	12*s.* 6*d.*
2033. Bull's-eye Condenser, with universal-jointed stem . .	12*s.* 6*d.*
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PURE WATER.

celebrated Physician has recently stated—"A great amount of illness would be ted were the inhabitants of this city, and elsewhere, to have their water filtered just e drinking, or mixing it with their food. Impure water, such as is daily drank by ands, acts as a slow poison, especially to the young, the delicate, the consumptive, uch as are in ill health."

LIPSCOMBE & Co.,

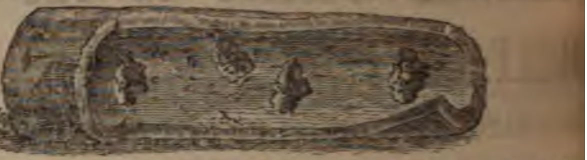
By appointment to the Queen,

3. REGENT STREET, LONDON, AND 82. MARKET STREET, MANCHESTER,

WARRANT THEIR FILTERS

e superior to all others, removing taste, smell, and colour from all kinds of water

WATER POISONED BY LEADEN PIPES



"The above Engraving represents accurately a section of a leaden pipe, which w employed for a short time in conveying water from a well on the grounds of Mr. B of Bonchurch, Isle of Wight. The original section of the pipe is 8¼ inches long, 2¼ in diameter, and 5-16 inches thick. A great part of the internal surface is corroded by th action of the water; but as shown in the drawing, four deep excavations have been ma and another is shaded out of view by the manner in which the section of the pipe h been cut. The water has cut these deep pits almost through the pipe, and not only in the portion which we have illustrated, but has formed similar chasms throughout entire length."—*Expositor.*

DURABILITY OF GUTTA PERCHA TUBING.

Many inquiries having been made as to the durability of Gutta Percha Tubing, Gutta Percha Company have pleasure in giving publicity to the following letters f parties who have had it in use for a considerable length of time.

From Sir RAYMOND JARVIS, Ventnor, Isle of Wight.

(Second Testimonial.)

"March 10th, 18

"In reply to your letter received this morning, respecting the Gutta Percha Tu for pump service, I can state, with much satisfaction, it answers perfectly. Many bui and other persons have lately examined it, and there is not the least apparent differ since the first laying down, now several years. I am informed that it is to be ad generally in the houses that are being erected here."

From this testimonial it will be seen that the *Corrosive Water of the Isle of Wight* not affect Gutta Percha Tubing.

POISONED WATER PREVENTABLE

BY THE USE OF

GUTTA PERCHA TUBING.

The Gutta Percha Company have the pleasure of acknowledging the receipt of the following Letter,

From Dr. MURRAY, Hull.

"Portland Place, March 29th, 18

"It is impossible to conceive of any thing more injurious or destructive to the heal the community than the use of *leaden pipes* for the conveyance of water. The poison salts of lead thereby communicated are most insidious and subtle. *I hail with grat the substitution of Gutta Percha Tubing. I have had the leaden pipe of my own h removed, and supplied with one of Gutta Percha.* Nothing can be better. I have recommended it to others, who have adopted the expedient."

Every variety of Gutta Percha articles, such as Mill Bands, Tubing, Soles, S Pump Buckets, Fire Buckets, Bosses, Union Joints, Flasks, Bottles, Bowls, Ch Vessels, Toilet Trays, Curtain Rings, Galvanic Batteries, Talbotype Trays, &c., manufactured by the Gutta Percha Company, and sold by their wholesale deale town and country

Submarine and Subterranean Telegraph Wires insulated with Gutta Percha

N.B.—The Company's Illustrated Circulars, with instructions for Joining Tubes, and for securely attaching Gutta Percha Soles will be forwarded (post free) on re of four postage stamps

THE GUTTA PERCHA COMPANY

PATENTEES,

18, WHARF ROAD, CITY ROAD, LONDON.

DR. DE JONGH'S

GHT-BROWN COD-LIVER OIL.

pared for Medicinal Use in the Loffoden Isles, Norway, and put to the Test of Chemical Analysis.

PRESCRIBED BY EMINENT MEDICAL MEN AS
THE MOST EFFECTUAL REMEDY FOR

SUMPTION, BRONCHITIS, ASTHMA, GOUT, RHEUMATISM, SOME DISEASES OF THE SKIN, RICKETS, INFANTILE WASTING, GENERAL DEBILITY, AND ALL SCROFULOUS AFFECTIONS.

PURE AND UNADULTERATED.

great difficulty of obtaining genuine and good Cod-liver Oil has long prevented a appreciation of its acknowledged remedial virtues, and precluded many suffering lids from realizing the beneficial effects of this truly valuable Medicine.

r. de Jongh's Light-brown Cod-liver Oil is of the best kind and finest quality, being acted from the liver of the Dorse — *Gadus Calurias* (a species of Cod fish, caught at Great Fishery of the Loffoden Isles,)—by a process yielding a much larger proportion dine, phosphate of lime, volatile acid, the elements of the bile, and other essential ciples, than the Pale Oils manufactured in England and Newfoundland, which, by r mode of preparation, are deprived in a great measure of their active elements.

he well-merited celebrity of Dr. de Jongh's Oil is attested by its extensive use in nce, Germany, Holland, Belgium, and Italy, by numerous spontaneous testimonials n eminent members of the Faculty and scientific Chemists of European reputation, since its recent introduction into this country, by the marked confidence, as well as t success, with which it has been prescribed by Medical Practitioners.

timonial from the late JONATHAN PEREIRA, M.D., F.R.S.E., F.L.S., Professor the University of London, Author of "The Elements of Materia Medica and herapeutics," &c. &c.

Y DEAR SIR, — I was very glad to find from you, when I had the pleasure of seeing in London, that you were interested commercially in Cod-liver oil. It was fitting the author of the best analysis and investigations into the properties of this oil ld himself be the purveyor of this important medicine.

feel, however, some diffidence in venturing to fulfil your request by giving you my ion of the quality of the oil of which you gave me a sample; because I know that no can be better, and few so well, acquainted with the physical and chemical properties is medicine as yourself, whom I regard as the highest authority on the subject.

can, however, have no hesitation about the propriety of responding to your applica-. The oil which you gave me was of the very finest quality, whether considered reference to its colour, flavour, or chemical properties; and I am satisfied that for icinal purposes no finer Oil can be procured.

ith my best wishes for your success, believe me, my dear Sir, to be very faithfully rs,

(Signed) JONATHAN PEREIRA.

insbury Square, London,
April 16: 18[illegible]1.
Dr. de Jongh.

Extract from "THE LANCET," July 29, 1854.

"Cod Liver Oil has become one of the most generally prescribed and popul of the day, and there are but few medical men who have prescribed it larg not bear witness to the benefit very frequently derived from this remedy, es cases of scrofula and phthisis.

"After a careful examination of the different kinds of Cod-liver Oil, Dr gives the preference to the light-brown oil over the pale oil, which contains sc volatile fatty acid, a smaller quantity of iodine, phosphoric acid, and the e bile, and upon which ingredients the efficacy of Cod-liver Oil no doubt partl Some of the deficiencies of the pale oil are attributable to the method of its p and especially to its filtration through charcoal. In the preference of the li over the pale Oil we fully concur.

"We have carefully tested a specimen of the Light-brown Cod-liver Oil, pr medical use under the direction of Dr. de Jongh, and obtained from the wholes Messrs. Ansar, Harford, and Co., 77, Strand. We find it to be genuine, a iodine and the elements of bile."

"THE MEDICAL CIRCULAR," May 10, 1854.

"Since Cod-liver Oil has become so generally employed for medicinal pur of the highest importance that the kind most suitable to the relief of disease determined. It is the object of Dr. de Jongh to settle this disputed point. purpose, he has conducted elaborate chemical experiments to ascertain the co of the several qualities of oil in use, and has also experimented on the sick i discover which preparation enjoyed the greater efficacy. He has also availed l the experience of other practitioners, both British and foreign. From these he has arrived at the conclusion that the light brown oil is the most efficacious kinds of cod oil; and that the pale oil, if not actually inert, is nevertheless d many of the essential active principles which the light brown contains. We be his conclusions will be verified by most practitioners who have had any expe the use of cod oil.

"We unhesitatingly recommend Dr. de Jongh's Light-Brown Oil as the medical purposes, and well deserving the confidence of the profession."

* * *

Sold Wholesale and Retail, in Bottles, labelled with DR. DE JONGH'S St Signature, by

ANSAR, HARFORD, AND C

77. STRAND, LONDON.

Sole Consignees and Agents for the United Kingdom and British Possessio may be obtained from respectable Chemists and Druggists in Town and Count following prices:—

HALF-PINTS - - -	**2s. 6d.**
PINTS - - - - -	**4s. 9d.**
QUARTS - - - - -	**9s.**

IMPERIAL MEASURE.

*** Four Half-pint Bottles forwarded, CARRIAGE PAID, to any part of Engl receipt of a remittance of Ten Shillings.

UNDER PATRONAGE OF ROYALTY AND THE AUTHORITY OF THE FACULTY.

KEATING'S COUGH LOZENGES.

A CERTAIN REMEDY for Disorders of the *Pulmonary Organs*: In Difficulty of Breathing—in ndancy of Phlegm—in Incipient CONSUMPTION (of which COUGH is the most positive indication), they f unerring efficacy. In ASTHMA, and in WINTER COUGH, they have *never* been known to fail.

EATING'S COUGH LOZENGES are free from every deleterious ingredient; they may, therefore, ken at all times *by the most delicate female and by the youngest child*; while the PUBLIC SPEAKER and PROFESSIONAL SINGER will find them invaluable in allaying the hoarseness and irritation incidental to l exertion, and consequently a powerful auxiliary in the production of MELODIOUS ENUNCIATION.

Prepared and Sold in Boxes, 1*s.* 1½*d.*, and Tins, 2*s.* 9*d.*, 4*s.* 6*d.*, and 10*s.* 6*d.* each, by THOMAS ATING, Chemist, &c., No. 79. St. Paul's Church Yard, London. Sold Retail by all Druggists and nt Medicine Venders in the World.

N.B.—To prevent spurious imitations, please to observe that the words "KEATING'S COUGH LOZENGES" engraven on the Government Stamp of each Box, without which none are genuine.

VALUABLE TESTIMONIALS.

opy of a Letter from the late COLONEL HAWKER (the well-known Author on "GUNS AND SHOOTING").

Longparish House, near Whitchurch, Hants,
October 21st, 1846.

SIR,—I cannot resist informing you of the extraordinary effect I have experienced by taking only a few our LOZENGES. I had a cough for several weeks, that defied all that had been prescribed for me; yet I got completely rid of it by taking about half a small box of your Lozenges, which I find are the ones that relieve the cough without deranging the stomach or digestive organs.

I am, Sir, your humble servant,
o MR. KEATING, 79. St. Paul's Church Yard. P. HAWKER.

Important to Clergymen, Public Speakers, Singers, &c.

St. Paul's Cathedral, 30*th Nov.* 1849.

SIR,—I have much pleasure in recommending your *Lozenges* to those who may be distressed with rseness. They have afforded *me relief on several occasions when scarcely able to sing* from the effects of rrh. I think they would be very useful to Clergymen, Barristers, and Public Orators.

I am, Sir, yours faithfully,
THOMAS FRANCIS,
To MR. KEATING. *Vicar Choral.*

ecent Testimonial to the value of Keating's Cough Lozenges.

I cannot express what I suffered,—coughing, expectorating, and the respiration impeded. Strange to I gradually recovered, without any treatment, except taking a few boxes of Keating's Cough Lozenges lungs were so much affected, and the general health so debilitated, that I had but little hopes of very.

3rd Nov. 1853. (Signed) J. PICKERSGILL,
o Mr. Keating, 79. St. Paul's Church Yard. Sergeant, 66th Regiment, Quebec.

PALE PURIFIED
NEWFOUNDLAND
COD LIVER OIL,
IMPORTED DIRECT BY
THOMAS KEATING,
79. St. Paul's Church Yard, London.

is valuable medicine having of late years come into such general use, and being, moreover, so extény prescribed by the most eminent practitioners both in town and country, Mr. KEATING can with the test confidence recommend this Oil as being perfectly pure, nearly tasteless, and free from adulteration y kind, being on its arrival subjected to every chemical test.

a constant supply is obtained direct from Newfoundland, the consumer may always depend upon ng the same genuine article. Previous to taking, Mr. KEATING requests that the Oil should be well ted, as in cold weather a deposit generally ensues.

old in Half-pint, Pint, Quart, and Five-pint Bottles, Imperial Measure.

⁂ *Orders from the Country should expressly state "Keating's Cod Liver Oil."*

SARSAPARILLA.

It is asserted by many eminent medical men, that there is **no medicine in t** Medica comparable to Sarsaparilla for recruiting the debilitated **constitution,** the tone of the stomach, improving the general state of the system, **and, by it** use, removing various morbid symptoms ascribed to a deranged **condition of** such as eruptions on the skin, ulcerations, scorbutic and cutaneous **diseases,** matic pains, operating as a general and complete purifier of the blood.

Butler's "Compound Concentrated Decoction, or Fluid Extract of Sarsaparilla"

Is the original of the now numerous preparations of the kind, **and is exten** scribed by Medical Practitioners. It is most carefully prepared **from the fine** Sarsaparilla imported, at a low temperature, so as to preserve **entirely the vir** root in the most efficient and concentrated form. A pint bottle **is equal to fou** the ordinary preparation.

Prepared and sold in pint bottles, 20s.; half-pints, 10s.; **and quarter-pint** by Butler and Harding, Chemists, 4 Cheapside, corner of **St. Paul's, Londo**

BUTLER'S TASTELESS SEIDLITZ POWD

IN ONE BOTTLE.

This useful aperient preparation, besides forming an equally efficient **and** agreeable draught than that produced by the common Seidlitz **Powders, is mad** less time, and with infinitely less trouble. To allay fever or **thirst, a teas** water forms a most refreshing Saline Draught. Being enclosed in **a bottle, it w** uninjured by humidity during the longest sea voyage or land journey.

Sold at 2s. 6d. the bottle (which is enclosed in a case, and accompanied by me spoon), by the preparers.

BUTLER'S EFFERVESCENT CITRATE OF MAGNES

OR, MAGNESIAN APERIENT, FOR DYSPEPTIC AND BILIOUS COMPLA

When taken after too free indulgence in the luxuries of the table, **particularly** much wine, the usual disagreeable effects are altogether avoided. In warm c will be found extremely beneficial, by correcting the disordered **biliary secretio** debilitating the stomach.

BUTLER'S PURE PONDEROUS CALCINED MAGNE

Prepared after a peculiar process, whereby it is perfectly **deprived of Carbo** freed from taste and smell, and every unpleasant property, **and the bulk requ** dose reduced to one-half of that prepared in the usual way. **In bottles at 2s. 9d.**

BUTLER'S CONCENTRATED ESSENCE OF GINGE

AND ESSENCE OF GINGER AND CHAMOMILE,

Is found useful in indigestion and flatulence, and as a **warm stomachic, for col** and rheumatic habits. No family should be without this **valuable preparatio** numerous cases, a dose or two has checked, and frequently **cured, most violen** of indigestion, flatulency, spasm, cramps, &c.

Sold in bottles, 2s. 9d., 4s 6d., and 10s. 6d.

☞ All Medicinal Preparations of repute, **established Patent Medicines, P** &c. &c., with allowance to Merchants and others, for exportation, of

BUTLER AND HARDING,

Chemists,

4, CHEAPSIDE, CORNER OF ST. PAUL'S, LOND

OLD DR. JACOB TOWNSEND'S AMERICAN SARSAPARILLA.

This is one of the most extraordinary and valuable Medicines in the world. Its superiority over other preparations of like character, made in this country, arises from the mode of the manufacture, and the advantage of obtaining and working the root in its green and fresh state. The root, when brought into this country, is dry, vapid, and almost tasteless, its virtues and juices having all evaporated; while it often becomes mouldy, musty, and partially decayed, so that it is quite unfit for use.

ENGLISH TESTIMONY.

We give a few of the many communications we have received since we have been in England, from those who have experienced the great benefits of using this celebrated medicine. They must have some weight in convincing the public of its great value.

"49. Davies Street, Berkeley Square, Sept. 1. 1851.

"Gentlemen,—I have much pleasure in testifying to the numerous thanks I have received from various persons who have taken Old Dr. Jacob Townsend's Sarsaparilla, many of whom will be happy to give you testimonials, should you require them. I am doubly pleased at being able to speak to the good effects I have seen *myself produced* by the Sarsaparilla, for, I must confess that, although I was not prejudiced, I was rather sceptical, as to its virtues, which I would not have believed it possessed, had I not seen it. I am, gentlemen, your obedient servant,

"Messrs. Pomeroy, Andrews, & Co." "JOHN JAIMERSON."

FURTHER IMPORTANT TESTIMONY.

GREAT CURE OF PILES.

"17. Phelps Street, Walworth, Feb. 22, 1853.

"Gentlemen.—I was afflicted with the blind Piles, and was under medical treatment for three months, but obtained no relief. Hearing of Old Dr. Jacob Townsend's Sarsaparilla, I obtained some, and, after taking it a short time, the accumulated corrupt matter copiously discharged, and I almost immediately obtained relief. I still continued its use for a time, and not only found relief, but a cure, and am now free from pain. I most sincerely recommend it to all who are similarly affected. I am, gentlemen, your obedient servant,

"Messrs. Pomeroy, Andrews & Co." "WILLIAM HYDE."

"8. Ashley Terrace, City Road, London, June 9. 1852.

"Gentlemen,—Please send me again three quart bottles of Old Dr. Townsend's Sarsaparilla. I feel much better, and the general system greatly improved, and I hope I shall be all right with the three now ordered. I am, gentlemen, your's very respectfully,

"Messrs. Pomeroy, Andrews & Co., 373. Strand." "JOHN W. MUNCH."

William Wearn, 1. High Street, Southsea, writes: "I have taken several bottles of Old Dr. Townsend's Sarsaparilla, and derived benefit from it." Rev. J. W. Wilson, Wesleyan Minister, at Biggleswede, writes, June 7. 1852, "I have derived much benefit from taking Dr. Townsend's Sarsaparilla."

FEMALE COMPLAINTS.

GREAT CURE OF NERVOUSNESS.

"London, June 10. 1852.

"Gentlemen,—My wife has been long affected with a nervous complaint from which she suffered severely. Able physicians and many remedies were tried in vain, but I am happy to inform you that she has entirely recovered by using a few bottles of Old Dr. Townsend's Sarsaparilla.

"Messrs. Pomeroy, Andrews & Co." "J. R. PETERSON."

PIMPLES, BLOTCHES, ERUPTIONS, &c.

The same may be said of these as in the cure of the severer chronic maladies. The Sarsaparilla and the Ointment will effectually wipe off all disagreeable eruptions, and render the surface clear and beautiful. Ladies troubled with rough pimply skin, or gross masculine surface, will do well to use these Medicines, if they wish clear, delicate, and transparent complexions. Nothing can exceed their efficacy in this respect.

SICK HEADACHE—A CASE OF MANY YEARS' STANDING.

The following is one of those cases arising from a disordered state of the uterine functions, which affect the whole system, and bring on some of the most distressing sufferings. The lady has suffered more or less for ten years, and has now entirely recovered by the use of Dr. Townsend's Sarsaparilla. She says:—

"Berkeley Square, Jan. 15. 1853.

"Messrs. Pomeroy & Co.—I have used your Dr. Townsend's Sarsaparilla for sick headache and general debility, arising from a disordered state of my system, and am happy to inform you that it has completely restored me to my former health and strength. I experienced a degree of comfort, buoyancy of spirits, and renewed strength, which I have not known for ten years. This great benefit alone induces me to write to you an acknowledgment. Disliking my name in full to go before the public, I give my initials only.

"Mrs. E. W. T. C."

Half-pints, 2s. 6d.; Pints, 4s.; Quarts, 7s. 6d.; and Mammoths, 11s.; Six Mammoths sent free for 60s.

POMEROY, ANDREWS, & CO., Sole Proprietors.
Warehouse, 373. Strand, London.

FOREIGN MEDICAL DEPOT.

ROBERT KING,

FOREIGN AND ENGLISH PHARMACEUTICAL CHEMIS

21, PRINCES STREET, HANOVER SQUARE,

LONDON.

Foreign and English Prescriptions accurately dispensed.

PHARMACEUTICAL PREPARATIONS: PREPARED ACCORDING TO THE ESTABLISH FOREIGN PHARMACOPŒIAS.

Medicinal Plants, Mineral Waters, Syrups, Pates, &c.

R. K. particularly invites attention to a newly introduced FEEDING BOT being better adapted for infants than those in ordinary use.

Agent for all French Patent Medicines.

THE GUARDS' CLUB AND SULTAN'S BOUQUE

MADE ONLY BY

L. T. PIVER,

PERFUMER AND GLOVER,

160. REGENT STREET, LONDON.

They are delicate and most exquisite Perfumes; are patronised by the Court, t Aristocracy, and the members of the Guards' Club, and have become

AN INDISPENSABLE REQUISITE TO THE TOILET OF THE FASHIONABLE WORLD,

as well as the SAVON DE LAITUE (Lettuce Soap), the emollient properties of soap are proverbial, also its great utility in whitening the skin; when used as a sh soap, it is superior to all others; it obtained the Prize Medal for Toilet Soap Perfumery.

THE REAL JOUVIN'S GLOVES,

as well as the Guard's Club Bouquet, the English and Imperatrice Bouquets, being and delicious perfumes, and the Lettuce Soap, are

Sold in London only at L. T. PIVER'S, 160. Regent Street.

Jouvin is the only Glove-maker who has obtained a Gold Medal in France f excellence of cut and the superiority of his Gloves over those of all other makers,

HE TEA ESTABLISHMENT,

4 & 5. KING WILLIAM STREET, CITY.

THE ALTERATION IN THE TEA DUTY.

econd alteration in the Tea Duty, took place on the 6th instant: the duty was educed from 1*s.* 10*d.* to 1*s.* 6*d.* per lb., at which rate it is to remain until April the following year it will be 1*s.* 3*d.*; and from the 6th of April, 1856, only lb.

first alteration in the duty was 4¼*d.* per lb.; but as the Market Price of Tea ed last year from 4*d.* to 6*d.* per lb. as compared with the Prices ruling in 1852, hole of the reduction in the duty was absorbed in the enhanced value of the , so that towards the middle of November, Tea was no cheaper to the consumer was before the alteration.

case is different now.— The Market has been very quiet since the comment of the year, slightly receding during the last month, and as there is no of further speculation now that we are engaged in a war, the termination of it is impossible to foresee, we are not only able **to give our Customers the it of the full reduction of 4d. per lb.,** but, at the same time, **to give oved quality at the reduced prices.**

stated in our introduction of this concern to the public in 1836, "**Price unacanied by quality is a mere deception:**" we think it necessary to repeat the quoting of low prices to Teas, the quality of which will not bear out the ption, is a practice so extensively adopted by advertising houses as to require and the utmost caution of families.

direct particular attention to the subjoined list, which is framed more as a **guide e selection of suitable articles,** than as a **mere exhibition of low s,** the latter only tends to disappoint the purchaser.

BLACK TEAS.

		s.	*d.*	
n Congou		2	8	
ongou		2	10	—former price - - - 3s. 2d.
NG CONGOU, full flavour, Souchong kind		3	0	—recommended, former price 3s. 4d.
CONGOU, Pekoe Souchong kind	3s. 2d. to	3	4	—recom. former price, 3s. 6d. to 3s. 8d.
FINE CONGOU, rich and strong		3	8	—recommended, former price 4s. 0d.
T CONGOU, wiry blackish leaf, full rich Pekoe ouchong flavor		4	0	—highly recom., former price 4s. 4d.
Souchong, very choice		4	4	—recommended, former price 4s. 8d.
Orange Pekoe, good to fine		3	8	to 4s.
Orange Pekoe, very choice		4	8	

GREEN TEAS.

ind		3	0	
yson		3	4	
HYSON, full flavour		3	8	—recommended, former price 4s. 0d.
FINE HYSON, fresh burnt, full flavour	4s. to	4	8	—recom. former price, 4s. 4d. to 5s. 0d.
FINE HYSON, rich delicate flavour		5	0	—recommended, former price 5s. 4d.
Iyson, bright close leaf, very choice		5	8	—recommended, former price 6s. 0d.
Hyson	2s. 10d. to	3	0	
oung Hyson		3	4	—former price - - - 3s. 8d.
OUCHAIN, strong burnt flavour		3	8	—recommended, former price 4s. 0d.
FINE OUCHAIN	4s. to	4	8	—recom. former price, 4s. 4d. to 5s. 0d.
T OUCHAIN, small close wiry leaf		5	0	—recommended, former price 5s. 4d.
T IMPERIAL		4	8	—recommended, former price 5s. 0d.
der, Canton kind	2s. 10d. to	3	4	
der, genuine	3s. 8d. to	4	4	
UNPOWDER, strong burnt flavour		4	8	—recommended, former price 5s. 0d.
FINE GUNPOWDER, rich strong burnt		5	0	—recommended, former price 5s. 4d.
T GUNPOWDER, very choice		5	8	—recommended, former price 6s. 0d.

COFFEE.

ppears from the fines continually inflicted by the Board of Inland Revenue, that the ADULTE-N OF THIS ARTICLE is still carried on to a great extent, notwithstanding the various y minutes issued for the prevention of this DEMORALISING FRAUD.

those who wish to purchase Coffee in its NATIVE PURITY—in possession of its NATURAL A AND FRAGRANCE, and at those ECONOMICAL PRICES, which families who buy for e a fair claim to expect, the following selection is offered:—

Good Ceylon Coffee	per lb.	0s.	10½d.	
FINE PLANTATION		1	0	
FINEST PLANTATION		1	2	—recommended.
FINEST SOUTH AMERICAN, OR COSTA RICA		1	3	—recommended.
CHOICE MOUNTAIN FLAVOURED COFFEE		1	4	—recommended.
CHOICE OLD MOCHA		1	5	—recommended.

.—*CASH on delivery of Goods. To Parties residing in the country, if accompanying their Orders with a respectable reference, a remittance on receipt of them will be satisfactory.*

RIDGWAY & COMPANY,

DON, DECEMBER, 1854.

4 & 5, King William Street.

SPICES.

We direct attention to the reduction in the price of Cloves, Mace, and Nutmegs, in consequence the alteration in duty.

Brown Nutmegs - - - - - - - per lb.
Finest picked BROWN NUTMEGS - - - - - - -
Best CINNAMON - - - - - - - -
Ditto ditto ground - - - - - - -
CASSIA - - - - - - - -
Finest PENANG CLOVES - - - - - - -
Bourbon ditto - - - - - - - -
Finest MACE, bright - - - - - - - -
Finest scraped Jamaica GINGER - - - - - -
Fine ditto ditto - - - - - - -
Inferior ditto - - - - - - - - 10d. to
Finest unbleached ditto - - - - - - - -
Fine African ditto - - - - - - - -
Fine East India ditto - - - - - - - -
Finest Ground Jamaica GINGER - - - - - -
Fine ditto ditto - - - - - - 6d. to
PIMENTO - - - - - - - - -
Heavy shot BLACK PEPPER - - - - - - -
Finest WHITE PEPPER - - - - - - - -
Finest CAYENNE PEPPER - - - - - - -
Long PEPPER - - - - - - - - -
Genuine Mixed Spice - - - - - - - -
MUSTARD - - - - - Superfine, 1s.; Fine, 8d.; Seconds
Ditto Double Superfine - - - - - - -
Ditto ditto packed in Tinfoil - - - - -

COCOA, CHOCOLATE, &c.

Homœopathic or Dietetic Cocoa - - - - - per lb.
Taylor's Homœopathic Cocoa - - - - - - - -
Soluble Cocoa, do. do. - - - - - - - -
Finest do. do. do. - - - - - - - -
Soluble Cocoa, loose - - - - - - - - -
Fry's Patent Cocoa - - - - - - - - -
White's Patent Cocoa - - - - - - - - -
Finest Flaked Cocoa - - - - - - - - -
Cocoa Nuts - - - - - - - - -
Cocoa Nibs - - - - - - - - -
Cocoa Shells - - - - - - - - -
Chocolate Paste, in ½-lb. Pots - - - - - - - -
Chocolate Powder, in ½-lb. Tins - - - - - - - -
Ditto do. loose - - - - - - - -
Plain Chocolate - - - - - - - - -
Best Plain Chocolate - - - - - - - - -
Sir Hans Sloane's Chocolate - - - - - - - -
Churchman's Chocolate - - - - - - - -
Finest Broma - - - - - - - - -
Isinglass, Brazil - - - - - - - -
ISINGLASS, best picked - - - - - - - - -
Ditto coarse cut - - - - - - - - -
Finest Pearl Sago - - - - - - - - -
Finest West India Arrow Root - - - - - - - -
Finest Tapioca - - - - - - - - -
Finest Semolina - - - - - - - - -

TO THE INHABITANTS OF LONDON,

And the Suburbs, Six Miles from the City.

THE following arrangement of the time and mode of departure of our Vans for the delivery of parcels has been found so convenient to our customers, *from the experience of above Seventeen years*, that we continue to follow it.

To the West End Daily,
One Van at 9 o'Clock in the Morning.

To Islington Daily,
One Van at Eight o'Clock in the Morning.—Tuesday excepted.

To the Borough Daily,
One Van at 4 o'Clock in the Afternoon.

To every part of the City, Goods will be delivered on the same day, provided the Order is not given later than Five o'Clock in the Afternoon.

Bayswater and Kensington,
Three days a week—Monday, Wednesday, and Friday.

Chelsea and Brompton,
Three days a week—Tuesday, Thursday, and Saturday.

Wapping, Shadwell, Poplar, Blackwall, Bow, Stratford, and the East End generally.
One day a week—Thursday.

And to the Suburbs, according to the following classification :—

Monday's District.

Battersea
Wandsworth
Putney
Roehampton
Richmond
Barnes
Kew
Sheen
East Sheen
Mortlake
Fulham
Hammersmith
Turnham Green
Shepherd's Bush
Walham Green
Parson's Green
Chiswick
Isleworth
Brentford
Acton
East Acton
Ealing

Tuesday's District.

Wandsworth-road
Clapham
Brixton
Stockwell
Streatham
Tulse Hill
South Lambeth
Forest Hill
Sydenham
Norwood
Croydon
Beckenham
Beddington
Mitcham
Carshalton

Wednesday's District.

Woolwich
Greenwich
Lee
Lewisham
Blackheath
Old Kent-road

Thursday's District.

Walworth
Peckham
Camberwell
Dulwich
Denmark Hill
Herne Hill
Deptford
Rotherhithe
Woodford
Walthamstow
Leyton
Leytonstone
Wanstead
Ilford
East Ham
West Ham
Plaistow

Friday's District.

Hackney
Homerton
Clapton
Tottenham
Stamford Hill
Stoke Newington
Dalston
Kingsland
Edmonton
Enfield
Southgate
Winchmore Hill

Saturday's District.

Holloway
Highgate
Hampstead
Kentish Town
Camden Town
Hornsey
Finchley
Hendon
Kingsbury
Kilburn

Families are respectfully requested to observe, that all orders should be sent at least *one day previous* to delivery.

RIDGWAY & COMPANY,

The TEA Establishment, 4 & 5, King William Street, City, London.

BETTS'S
TEA AND COFFEE WAREHOU

262. OXFORD STREET,

CORNER OF NORTH AUDLEY STREET.

J. F. BETTS, in returning thanks to the Nobility, Gentry and Public, but more larly to the Clergy and Gentlemen of the Medical Profession, for their liberal p and recommendation, begs to assure them they may rely on all articles purc this Establishment being not only pure but of the first quality.

When the adulteration of Coffee was allowed by Government, it may be reference to the report of the Analytical Sanitary Commisson of the "Lanc January 4th, 1851, that out of between twenty and thirty samples of Coffee, pro pparently reputable Establishments, only two proved to be genuine, viz urchased of

Mr. J. F. BETTS,

262. OXFORD STREET, Corner of NORTH AUDLEY STREET,

And Messrs. Knight and Son, Gracechurch Street, City; which we iounced of "excellent quality and high flavour: the price paid at the Shop BETTS was **1s. 4d. per pound**; in both instances the articles were entirely fr adulteration."

It is also shown, by the report of the Commissioners, that Chicory, the chief artic in the adulteration of Coffee, is itself grossly adulterated with the most del compounds.

No. 262. OXFORD STREET, has now been established for more than Century as a TEA, COFFEE, and SPICE WAREHOUSE. The principle on the business is conducted being to supply every article in its pure state, at the remunerating prices.

The duty on Coffee being reduced to one uniform rate of 3d. per pound, J. F. B begs to state that he has made a proportionate reduction in prices.

Goods forwarded to all parts of Town free of expense; per rail to the Coun remittance of a post-office order, or respectable references.

BETTS'S
TEA AND COFFEE WAREHOUSE,

262. OXFORD STREET, Corner of NORTH AUDLEY STREET.

PURE as well as FINE TEA.

TEA *when pure* is well-known to produce a most wholesome beverage; the impolicy of allowing it to be coloured by the Chinese is fully set forth by the Sanitary Commissioners in the *Lancet*, and also in the *Times*, (October 6th, 1852). The fact, therefore, is now familiar to most, that *artificial colour is used* to give the *Spring crop* and the spent *Autumn gathering* the SAME *appearance*. If this practice were discontinued, a *twofold benefit* would arise; *first*, the fine qualities would have all the fragrance and strength unimpaired; and, *secondly*, the inferior faded leaves could not then be passed off as *good*, causing the flat insipid infusion so frequently the subject of remark.

Dr. URE writes, "The Uncoloured Tea seen by me in the Docks (London), imported from China, by HORNIMAN and Co., is perfectly pure; the Green, from the absence of the usual artificial colouring, is of a *natural olive hue*." They are exclusively of the *spring product* from *young and vigorous* plants, which yield not only *more strength*, but the full degree of *fragrance* which FINE Tea, when purely natural, and seasonably selected, *alone* possesses; ONE TRIAL induces a continued preference. The prices are REDUCED:—

Finest Congou imported - - -	3s. 8d.
Finest Lapseng Souchong -	4s. and 4s. 8d.
Fine and Pure Green	3s. 8d., 4s., and 4s. 8d.

HORNIMAN & CO.,

WORMWOOD STREET, LONDON,

Importers of the most approved Teas in general use, but free from the objectionable artificial colour on the surface,

LONDON:

Purssell, 80, Cornhill; Elphinstone, 227, Regent Street; Elphinstone, 366, Oxford Street.

Sold by authorized Agents in all Towns in 1 lb., ½ lb., and ¼ lb. Packages.

UNADULTERATED GROCERI

THE CENTRAL CO-OPERATIVE AGENC

IS

356,——OXFORD STREET,——356,

Established under the supervision of trustees, with the view of protecting the
from the frauds and other evils arising from the almost general practice of ad
by tradesmen, particularly Grocers The distinguishing features of the agency
it describes each article correctly, and sells it for what it really is, and in
guarantees right quantity and fair value.

TRUSTEES:

E. V. Neale, Esq. | Thomas Hughes, Esq.

Few CONGOU or SOUCHONG TEAS

Are satisfactory to the consumer when unmixed. The following mixtures h
found to give satisfaction, both as regards strength and flavour, and are
recommended for Family use.

Black Tea, first quality - - -	4s.	6d.	per lb.	
" second quality - - -	4	0	"	
" third quality - - -	3	6	"	
Common Congou from - - -	2	8	"	
Green Tea, Young Hyson, true green leaf -	3	8	"	
Fine Gunpowder, burnt flavour - -	5	0	"	

COFFEE.

All Coffee sold by the Agency is guaranteed to be without mixture with Chicor
other adulterating substance. The firm being pledged not to sell mixtures o
and Chicory, decline mixing even at the request of their Customers. Persons
Chicory can have it by itself at its proper price.

Finest Coffee imported - - -	1s.	8d.	per lb.
Strong fine flavoured - - -	1	4	"
Common - - - - -	1	0	"
Pure Chicory - - - -	0	4	"

COCOA

Manufactured on the premises by steam power, and warranted genuine.

Cocoa nibs - - - - -	1s.	0d.	per lb.
Ground ditto - - - -	1	0	"
Ground, flaked, and rocked Cocoa -	0	10	"

All purchases are registered, and a bonus of five per cent. returned at the end
quarter.

Customers waited on for orders, and goods delivered in any part of London.

Orders from the country amounting to 5*l.* and upwards, sent carriage free to
of the United Kingdom.

Commercial Firm.

WOODIN AND JONES,

56, OXFORD STREET (Three doors west of the Panth

ALFRED WARTON,

(LATE BEACH & CO.),

TALIAN WAREHOUSEMAN AND FAMILY GROCER,

13. NORTH AUDLEY STREET, GROSVENOR SQUARE,

returning thanks to the Nobility, Gentry, and Public, for the patronage liberally tended to him for so many years, begs to assure them that all articles sold at his TABLISHMENT will be found of the very finest quality, and trusts, by selling those ticles at a moderate remunerating profit, to secure a continuance of that support ich has hitherto been generously evinced towards him. TEAS, COFFEES, COAS, &c., of the purest kind, perfectly free from all those objectionable admixtures strongly prohibited by Government.

A. W. particularly invites attention to his PICKLES and SAUCES, which are not cured from wholesale houses, but carefully prepared at home. The Pickles are made h the Pure Malt Vinegar so highly commended in the "LANCET" of August 28, 1852, d are entirely free from any of those unwholesome ingredients almost in general use improving the appearance of Pickles. The Sauces are prepared with great care, and tain nothing but what is wholesome and unadulterated. A good assortment PRESERVES, consisting of the choicest JAMS, JELLIES, &c., prepared from the est fruits, and entirely free from all colouring matter, or any other compound tending improve the appearance, but depriving the Preserve of its natural taste and usefulness. ery Article is warranted of the finest quality. All orders punctually attended to, and livered free of expense in Town.

* *Country Orders, amounting to Three Pounds and upwards, forwarded to any part Free of Carriage.*

ALFRED WARTON,

13. NORTH AUDLEY STREET, GROSVENOR SQUARE.

ESTABLISHED A HUNDRED YEARS.

COFFEE WITHOUT CHICORY.

e are so often asked the question with reference to the adulteration of Coffee, as to duce us most reluctantly to adopt this mode of informing our friends, the nobility, and e public generally, that we never have admitted on our premises any ingredient for the rpose of adulteration, as it is our opinion that nothing can improve the quality of ally good Coffee; nor will the distinguished patronage we have attained amongst the ghest circles be abused with extortionate prices. The system we adopt is to supply

FIRST RATE ARTICLES AT A VERY MODERATE PROFIT.

e take this opportunity also to state that we sell every kind of good Tea imported, and such prices that our friends at the West End cannot equal by going to advertising uses in the City.

JOHN BRANSCOMBE AND CO.,

THE ORIGINAL GOLDEN CANISTER,

88. PALL-MALL.

Purity and Economy Distinguish the Articles supplied

PHILLIPS AND COMPÀNY, TEA MERCHA

8. KING WILLIAM STREET, CITY, LONDON.

Strong Congou Tea	2s. 6d., 2s. 8d., 2s. 10d., 3s.
Rich Souchong Tea	3s. 2d., 3s. 4d., 3s. 6d., 3s.
BEST ASSAM PEKOE SOUCHONG TEA	4s.
Strong Green Teas, with flavour	3s. 0d., 3s. 4d., 3s. 8d., 4s. 0d., 4s.
True Pearl Gunpowder	4s.
The Best Pearl Gunpowder	5s.

COFFEE.

The Best Plantation Coffee, 1*s.* 0*d.*; the Best Costa Rica Coffee, 1*s.* 2*d.*; the Best West India Co

the Best Mocha Coffee, 1s. 4d. per lb.

COLONIAL PRODUCE AND SPICES.

Considerably under most Houses

Arrow Root, 8*d.*, 10*d.*, 1*s.*, 1*s.* 2*d.*, and 1*s.* 4*d.* Sago, 3*d.* and 4*d.*; Large Sago, 5*d.* Tapioca, 6*d.*; Tous les Mois, 6*d.*; Best, 8*d.* Maccaroni, Naples, 8*d.* Italian Maccaroni and Vermicelli, 10*d.* 6*d.* and 8*d.* Millet, 4*d.* and 5*d.* Rice, 2*d.*, 2½*d.*, 3*d.*, and 4*d.*; Best, 4½*d.* Scotch Barley, 2½*d.* Pearl

Cloves, 1*s.* 3*d.* and 1*s.* 6*d.*; Best, 2*s.* per lb. Nutmegs, 4*s.* 6*d.* and 5*s.*; Best, 5*s.* 4*d.* Mace, 4*s.* 5*s.* Cinnamon, 3*s.*; Best, 3*s.* 6*d.* Ground Cinnamon, 4*s.* Cassia, 1*s.* 2*d.*; Ground, 1*s.* 6*d.* B Best, 1*s.* and 1*s.* 2*d.* White Pepper, 1*s.* 4*d.*; Best, 2*s.* 8*d.* Cayenne, Best, 2*s.* Ginger, 6*d.*, 10*d.*, 1*s.* 8*d.*, and 2*s.*; Best, 2*s.* 4*d.* Mustard, 5*d.* 6*d.*, 7*d.*, 10*d.*, and 1*s.*; Best Mustard in England, 1*s.* in tin foil).

SUGAR.

For the convenience of their numerous customers, PHILLIPS & Co. supply Raw Sugar at 4*d.* 5*d.* per lb. Refined Sugar at 5*d.*, 5½*d.*, and 6*d.*

PHILLIPS & Co. send all goods CARRIAGE FREE, by their own vans, within eight miles of William street, City, and send Teas, Coffees, and Spices, CARRIAGE FREE TO ANY STATION OR MARKET TOWN IN ENGLAND, if to the value of 40*s.* or upwards.

A general Price Current is published every month, containing all the advantages of the London and is sent free by Post on application to

PHILLIPS AND COMPANY, TEA MERCHA

8. KING WILLIAM STREET, CITY, LONDON.

DOMESTIC ECONOMY

H. SPARROW & CO.,

Beg to announce that in consequence of the late Reduction of Dut the present depressed state of the Tea Market, they are enabled to o

Good Breakfast Congou at 2s. 8d., 3s., 3s. 4d., 3

Fine Souchong, 3s. 4d., 3s. 8d., and 4s.

Young Hyson, 3s. 4d., 3s. 8d., 4s., 4s. 4d., 4s. 8d., an

Gunpowder, 3s. 8d., 4s., 4s. 4d., 4s. 8d., 5s.

Fresh Roasted Coffee, 11d., 1s., 1s. 4d., and 1s.

per lb.

With every other article in the trade proportionally cheap, and of that sterling for which they have been celebrated for the last Twenty Years; a price-list may be had on application, post free, and parcels of 2*l.* value and upwards, rail any station in the kingdom.

ADDRESS,

HENRY SPARROW AND C

WHOLESALE DEALERS IN TEA,

372. OXFORD STREET, LONDON.

PURE COCOA.

Cocoa has been designated by Physicians of eminence as one of the richest productions f the vegetable kingdom, and, when properly prepared, is justly celebrated for its peculiarly invaluable nutritive properties.

So keen, however, has been the avidity to render this article a lucrative manufacture, nd so strenuous the competitive efforts thereby excited, that the most flagrant adulterations have been resorted to, with the sole aim of

LOWNESS OF PRICE,

until Cocoa has been unjustly brought into disrepute, the Public having long become disgusted with numerous vile compounds, which, whether vended under the captivating misnomers of

"HOMŒOPATHIC," "DIGESTIVE," "DIETETIC," &c. &c.

are all more or less the most nauseate concoctions, and indeed can hardly be considered as deserving any claim to the title or character of Cocoa.

The evils with which so baneful a system is fraught are strikingly manifest to the Medical Profession, who, highly esteeming

COCOA (IN ITS PURE STATE)

as an article of diet, frequently prescribe and recommend it to invalids, as a remedial agent in promoting health. The results are, however, too often rendered nugatory by the impurity of the article supplied.

The importance, as well as the uncertainty, of obtaining Cocoa in a genuine pure state, are alike sufficiently notorious. The only security adopted by many to guard against adulteration, has been to procure the Cocoa Nibs; but apart from the time and difficulty in extracting the entire strength and flavour of Cocoa in this form, no guarantee whatever is afforded that the Nuts are of the best quality.

The magnitude of our legitimate business as Tea Dealers necessarily precludes our devoting a strict and essential supervision to the manufacture of Cocoa; we have therefore completed arrangements with the highly respectable firm of

MESSRS. HENRY THORNE AND CO., LEEDS,

whose many years' successful experience in the preparation of this article, and the celebrity they have thereby acquired in the North of England, together with their uncompromising determination to adhere to the principle they originally adopted, viz., to manufacture only from the Choicest Nuts, and to rigidly eschew adulteration in any shape whatever, warrant us in recommending their

"GENUINE TRINIDAD COCOA"

to our numerous Friends, to the Medical Profession, and to the Public.

Your obedient humble Servants,

SIDNEY, WELLS, AND COMPANY,
Family Tea-Men, 8. Ludgate Hill.

Sole Agents for London.

BARRY & COMPANY,

COCOA AND CHOCOLATE MANUFACTU

6. TYPE STREET, FINSBURY,

LONDON,

Desire to call attention to their superior quality of Cocoas, sold by most r grocers in the United Kingdom.

Barry and Co.'s Roll Cocoa,

Perfectly Pure, and being freed from the shell and all superfluous oil, will superior to any other description of Genuine Cocoa. Also **Barry a Soluble and Pulmonic Cocoas,** so highly spoken of by the celebrated D Ure, M.D., in the underwritten certificate.

"Having tested Messrs. Barry and Company's Soluble, Pulmonic, and othe have much pleasure in stating that I consider them so well prepared, that retain the nutritive properties of the finest Trinidad Cocoa Nut, the proce manufacture is so excellent as to make them particularly bland, and accep most delicate stomach.

(*Signed*) "ANDREW

"18, Upper Seymour Street, Portman Square.
"*January* 23*rd*, 1854."

CADBURY BROTHERS,

COCOA AND CHOCOLATE MANUFACTUR

TO THE

QUEEN AND ROYAL FAMILY.

DIEU ET MON DROIT

The known character and quality of CADBURY BROTHERS' CO CHOCOLATES having secured to them the Royal Appointment, they can confidence solicit the patronage of the Nobility, Gentry, and Public in gene direct attention to their VANILLA and SPANISH CHOCOLATES, especially for the Royal Household. Also their

Pure Cocoa, Homœoapthic Cocoa, and Vanilla Chocolates, in Sticks, and Bon Bons.

FENCHURCH STREET, LONDON, & BIRMINGHAM

COCOA.

Of all articles of food, Cocoa, from the fact of its being especially the diet of the Invalid, should be above suspicion of having deleterious admixtures: and yet, what have people been drinking of late years under the name of Cocoa? What is the fact as revealed by the Analytical Sanitary Commissioners in their analysis of that article? Why, that out of the whole of the samples purchased at the different dealers in London only four were genuine; — ours being the best; being not only genuine, but free from husk and dust, and prepared with great care. — Vide *The Lancet*, May 31st, 1851.

In roasting the nut, fire is not allowed in immediate contact with the cylinder, but simply used to generate hot air, with which the nut is roasted. This is most important; preventing the nuts being scorched, which is often the case in the ordinary method of roasting, viz. placing the cylinder on a coal or coke fire, and thus preventing that rancidity, so unwholesome and disagreeable, and so frequently met with.

Sold in pound, half-pound, and quarter-pound Packets, at One Shilling per pound; of most Grocers in the Country; and of the Manufacturers, at the address below.

ARROW-ROOT,

GENUINE AS IMPORTED — even the lowest-priced warranted to be so.

Rio Arrow-root, 4*d.* per lb. *African* Ditto, 6*d.* (a very good article.) *Jamaica* Ditto, 8*d.* Finest Ditto, 1*s.* *St. Vincent's* Ditto (a beautiful article), 1*s.* 4*d.* The finest *Bermuda* Ditto that can be found in London, 1*s.* 8*d.* Seven Pounds or Fourteen Pounds of that at 8*d.* per lb., or any higher price, packed in Tin Canisters without extra charge.

HANDFORD & DAVIS, 61. HIGH HOLBORN.

DEWAR'S BROWN MUSTARD.

In the Great Exhibition of 1851, the specimens of Mustard exhibited by T. DEWAR *alone* obtained the honourable mention of the Royal Commissioners.

From M. SOYER, author of the "Gastronomic Regenerator."

"I have, with several friends at the Club, fairly tried your Mustard, and we pronounced the quality superior to any other, as regards purity, flavour, and strength."

"Reform Club, Pall Mall, Oct. 20, 1846." "A. SOYER."

"I have, at one time and another, examined more than fifty samples of Mustard Flour, and this is the only one in which I did not detect the presence of wheat flour or starch. "DOUGLAS MACLAGAN, M.D., F.R.S.E.,

"Edinburgh, May 8, 1846." "*Lecturer on Materia Medica.*"

Amongst a number of favourable notices, see "Lancet," of March 22nd, 1851, and June 14th, 1851.

MANUFACTORY, NEWCASTLE-UPON-TYNE.

LONDON DEPÔT, BELLE SAUVAGE YARD, LUDGATE HILL.

Where Sample Bottles, 1*s.* and 2*s.* each may be had.

NOTE.—The article which originally obtained such celebrity as "Durham Mustard," made from Brown Seed, when *genuine*, is of a greenish colour; that usually sold as such is made principally from the common yellow seed, its colour yellow, and even when free from adulteration, devoid of that delicious flavour and pungency peculiar to brown seed.

RUSSELL & Co.,

72 and 42, BOROUGH,

(Corner of St. Thomas's Street, immediately adjoining the Hospital,)

and King Street, Covent Garden.

42. BOROUGH,
Corner of St. Thomas's Street

IT has, for some time, been a source of great trouble to Families t
A CUP OF GOOD TEA; and, when found, it is sure to be appre

RUSSELL AND CO.

have always made it their study to purchase **Teas and Coffees of the**
Quality; and hope, by supplying a good article to the Public, to still m
that patronage which they have enjoyed for so many years.

In calling attention to their STOCK OF TEAS, they wish it to be par
understood, that they have endeavoured to combine QUALITY with ECONO
are now selling

A GOOD FAMILY TEA at 2s. 6d. per Poun

The VERY BEST, at 3s. 8d.;

they therefore feel assured that all those who may feel pleased to favour th
their patronage will find that

A really GOOD CUP of TEA can be procur
the above Establishment.

RUSSELL AND CO.'s

FINE OLD MOCHA COFFEE,

In High Perfection.

The peculiar flavour which is imparted to this Coffee makes it doubly relishing and appreciated by those who wish for a cup of good old Mocha Coffee. It is rich, mellow, and contains a fine aroma, which is pleasing to the taste, and well worthy the trial of the Connoisseur.

Price 1s. 6d. per Pound.

RUSSELL AND CO.'s

PURE COCOA;

the very best Diet Drink that can be offered to the Public, *especially to the Invalid, and those of Weak Digestion*; being highly nutritious in itself, and freed from the oily matter which so frequently makes it objectionable to persons of delicate stomach. This Cocoa can be had

In Tin Canisters of One Pound, at 10d.

⁂ *An Inspection is particularly invited.*

RUSSELL AND CO.'s

FINE BERMUDA ARROW-ROOT,

Warranted to be of the Purest Quality, and strongly recommended for making a nice and nourishing jelly, being particularly adapted for Invalids.

Sold in Pound Canisters, at One Shilling.

RUSSELL AND CO.'s

FINELY-CUT ISINGLASS,

Much approved of by all persons who have given it a trial. It has always been felt by the Middle Classes, who could not procure Isinglass, that it was one of the great luxuries denied to the needy on account of the extravagant price which it has hitherto realised; and considering it is partly a medicine as well as a food, it was much to be lamented that it always maintained its high price.

RUSSELL & Co. have, therefore, now on sale an article of a most excellent kind, which is within the reach of the poor, and will no doubt soon be the chief article of consumption in the time of sickness.

During the Analyses of the various Articles of Food, in the "LANCET" of Nov. 29th, 1851, it will be seen that, in many instances, Isinglass still retained its very high price, and therefore could only be purchased by those whose means were not limited; but the Poor, unfortunately, were denied that benefit, which they can now happily enjoy; as the same may be purchased at the above Establishment for nearly *one half the price usually charged by other Houses.*

The very finest Cut Isinglass, at 8d. per oz., or 10s. 8d. per lb.; the only quality sold by RUSSELL and CO.

RUSSELL AND CO.'s

ASSORTED JAMS;

Raspberry,
Red Currant,
Black Currant,

Gooseberry,
Damson, and
Greengage,

Made from the Finest Fruits that can be obtained.

These Jams are entirely free from the Colouring matter which is so ofte
in preserves generally: and RUSSELL AND CO. make it their study to s
best fruits, at the most suitable seasons of the year, and have them prepar
their immediate inspection.

Sold in Pound Pots, at 7½d.; or 7s. 3d. the Dozen.

RUSSELL AND CO.

in returning thanks to their numerous Patrons in the vicinity of London, ass
that all Articles sold at their Establishment will be sent forth of the Best
and where Pure Coffee is required, or with a small portion of Chicory, i
obtained by asking for it mixed or not; many persons still wishing to
slightly mixed, that the Coffee may not lose that richness which is imparted
the small admixture.

They beg respectfully to announce that it is not their practice to send
round from house to house with Assistants to solicit Orders; Economy of
ment, such as they adopt, cannot be reconciled with so extravagant an exp
but venture to hope that the very large amount of Patronage hitherto exte
still continue to increase in proportion to their determination still more to deser

All Orders are delivered daily in London, by their own
and within a distance of Four Miles free of expense.

⁂ *It is requested that all Country Orders may be accompanied by a Rem*
Post Office Order; but should a reference in London be made, payment on d
the Goods will be sufficient. When the Order exceeds £2 in amount, the G
be sent Carriage Free.

☞ Please to observe the Address:

RUSSELL AND CO.

72 and 42, Borough,
(Immediately adjoining St. Thomas's Hospital,)
and King Street, Covent Garden.

⁂ A LIST of the GENERAL ARTICLES sold at the above Establishments forwa
on receipt of a letter.

PURE COUNTRY BREAD,

Supplied Every Day by Train

BY

G. BILLINGS,

OF

SAWBRIDGEWORTH, HERTS.

Sawbridgeworth, Herts. 1852.

George Billings begs respectfully to call the attention of the Public to the subjoined Testimonial (vide "Lancet," March 26th, 1852) as to the pure and unadulterated nature of Bread made by him.

Having been earnestly solicited by numerous parties in London to introduce it to the Public, he has appointed as his agents:—

Mr. David Billings, 7, Ivy Place, Hoxton;
Mr. Holloway, 18, Liverpool Street, Bishopsgate.

N. B. All Bread supplied to the London public is stamped, — "G. Billings, Sawbridgeworth."

London Hospital, March 17th, 1852.

I have made a careful analysis of the Bread manufactured by Mr. George Billings, Sawbridgeworth, Herts, and I find that it is perfectly free from every thing of a deleterious nature: besides which, it is of good colour, and light texture, is pleasant to the taste, entirely free from acidity, easy of digestion, and apparently well suited to the wants of the dyspeptic.

HENRY LETHEBY, M.B.,
Professor of Chemistry, &c. in the London Hospital.

18, Upper Seymour Street, Portman Square,
November 4th, 1853.

Having submitted to careful analysis a loaf of Bread, manufactured by Mr. George Billings, of Sawbridgeworth, Herts, and placed in my hands for that purpose by Mr. D. Billings, of Ivy Place, Hoxton, I find the bread to be well made, free from acidity and all deleterious matter, and accordingly well adapted for the sustenance both of invalids and of persons in health.

ANDREW URE, M.D., F.R.S.,
Analytical Chemist.

⁂ *Orders by Post punctually attended to.*

BRAGG'S SCOTCH OAT CAKE AND OAT MEAL

The Public are not generally aware of the highly beneficial qualities of

THE OAT.

As an article of food it is pre-eminent for its digestive properties. In the northern parts of Britain it forms the principal food of the inhabitants, and to it they are not a little indebted for their physical power and robust constitution.

Dyspepsia is most frequently occasioned by the use of food either too much concentrated or too finely prepared.

To maintain permanent healthy action of the stomach, food must be presented to it in such a state as to leave it its proper functions to perform. It cannot allow its work to be done for it.

Persons suffering from Dyspepsia will find the

DIGESTIVE SCOTCH OAT CAKE

an invaluable article of diet.

Being aliment in its more primitive or natural state, it will be found the safest and best corrective of the evils arising from the use of food too finely prepared.

Persons who use it constantly find that it induces the healthy action of the stomach, and dispenses with the use of purgative medicines.

It is sold in 6*d.* Packages, and in Boxes at 2*s.* 4*d.* each; and can be forwarded to any part by sending a post-office order to Old Cavendish Street, addressed to

J. L. BRAGG,
BISCUIT BAKER,
2. WIGMORE STREET, CAVENDISH SQUARE.

Families can be supplied with the very best

OAT MEAL,

which, when stirred into boiling water until it becomes of the consistency of thick Gruel, adding a little Salt or Treacle, will form a highly nutritious and wholesome meal.

SOLD GENUINE BY

J. L. BRAGG,

2. WIGMORE STREET, CAVENDISH SQUARE.

HARDS'

ARINACEOUS FOOD

FOR INFANTS, INVALIDS,

AND PERSONS WITH IMPAIRED DIGESTION,

MANUFACTURED BY

JAMES HARDS, DARTFORD,

Miller to Her Majesty.

Copy of a Testimonial

GIVEN BY THE LATE

JONATHAN PEREIRA,

M.D., F.R.S.,

Assistant Physician to the London Hospital.

ave carefully examined, and repeatedly prescribed "Hards' Farinaceous
," (see Pereira's Treatise on Food and Diet, pages 309. and 473., &c.), which
pared from the most nutritious of the Cereal grains. It combines both nitro-
d and non-nitrogenized alimentary principles, and forms a very valuable Food
ildren and Invalids."

"JONN. PEREIRA, M.D., F.R.S.
"Assistant Physician to the London Hospital."

. Finsbury Square, July 1. 1843."

---

l at all respectable Chemists and Patent Medicine Vendors, Tea Dealers, and
Warehouses, in Packets at 1*s.* and 2*s.* each; also in Tin Cases at 7*s.* 6*d.* for
es and Exportation; and as a Caution against spurious imitations it is necessary
rve, that each Packet is signed

"JAS. HARDS."

PURE COUNTRY FLOUR.

WARRANTED FREE FROM ADULTERATION.

WHITES, for Pastry, the best that can be made.
FINE HOUSEHOLDS (recommended for making Bread).
SECONDS.
WHEAT MEAL, for Brown Bread.
BEST SCOTCH OATMEAL.

Delivered (not less than one peck, 14 lbs.) *to any part of London, Carriage free.*

TERMS, CASH.

PRICES ADVERTISED IN "TIMES" DAILY.

ADDRESS

HORSNAILL AND CATCHPOOL,
BULLFORD MILL, WITHAM, ESSEX,
OR
CALEDONIAN ROAD, LONDON.

THE

BEST FOOD FOR CHILDREN, INVALIDS, & OTHERS

ROBINSON'S PATENT BARLEY,

For making Superior BARLEY WATER in Fifteen Minutes, has not only obtained th patronage of her Majesty and the Royal Family, but has become of general use to ever class of the community, and is acknowledged to stand unrivalled as an eminently pur nutritious, and light food for Infants, Children, and Invalids; much approved for makin a delicious Custard Pudding, and excellent for thickening Broths or Soups.

ROBINSON'S PATENT GROATS

Form another diet universally esteemed for making a superior Gruel in Fifteen Minute light for Supper, and, alternately with the Patent Barley, is an excellent Food fo Children and Invalids, being particularly recommended by the Faculty as the purest an best preparation of the kind extant, and far preferable to the Emden Groats.

PREPARED ONLY BY THE PATENTEES,

ROBINSON, BELLVILLE, & Co., PURVEYORS TO THE QUEEN,
64, RED LION STREET, HOLBORN, LONDON.

Sold by all respectable Grocers, Druggists, and others, in Town and Country, Packets (lined with tin foil) of 6*d.* and 1*s.*; and in Family Canisters, at 2*s.*, 5*s.*, and 1 each.

SPECIMENS IN THE ROYAL

BOTANICAL GARDENS,

KEW,

AND THE

MUSEUM OF INDUSTRY,

DUBLIN.

The Director begs to convey to Mr. Thomas Styles

the best acknowledgments of the Commissioners of Her Majesty's Woods, &c., for the undermentioned contribution—viz.,

"An interesting and beautifully arranged series samples of Ashby's Prepared Groats, Barley and Pea Flour, which is deposited in the Museum.

(Signed) "W. J. HOOKER, Director.

"Royal Gardens, Kew, December 8, 1851."

The above honour, together with the fact that these were the only articles of the kind exhibited in the Crystal Palace during the Great Exhibition of 1851, furnish the best proof that need be adduced of their superior qualities. It is, however, needful to guard the Public against base imitations, packed also in tinfoil, and having labels of the same colour.

Pure Scotch Oatmeal may be had in any quantity, from a penny packet to a ton weight. Each packet is marked and warranted genuine as imported direct from Scotland; and, for the convenience of retailers, the penny packets are put up in boxes, containing six dozen each.

To be had only of

THOMAS STYLES,

DIRECT IMPORTER OF SCOTCH OATMEAL, PEARL BARLEY, ETC.,

148. UPPER THAMES STREET, LONDON.

Sole Manufacturer of ASHBY'S Groats and Barley, for making pure Gruel, &c., in a few minutes; also for BRIGHT'S original Custard Powder.

Retail by most respectable Chemists, Druggists, Grocers, Oilmen, &c., in town and country, in Packets, at 3d., 6d., and 1s. each.

ARROW-ROOT,

Eightpence per Pound. Fourteen Pounds and T
Ten Shillings.

WARRANTED GENUINE,

Imported direct from the West Indies.

CHAMPAGNE, Forty-two Shillings, in One Dozen Cas

THE FINEST BLACK TEA IMPORTED,

FOUR SHILLINGS PER POUND.

East and West India Preserves, Pickles, Curry Powder, &c., &c.

H. WARREN & Co.,

IMPORTERS OF CONTINENTAL AND COLONIAL PRODUC

302. REGENT STREET, LONDON.

ARROW-ROOT

Warranted Pure as imported, in 7 lb. tins, *Finest* St. Vincent, 7 lb. for 5*s.*; or Bermuda, 7 lb. for 8*s.*

6 lb. Tins of **Strong Breakfast kind of Tea, 18s.** each, or **6 lb.** of a Mixture of

CHOICEST BLACK TEA,

For 24s.,

Mixed with Green when required.

3 *lb. JARS OF PRESERVED GINGER,* 3*s. Each.*

All sent carriage paid if 40*s.* worth be ordered. Price Lists, Post Free, on applicatio

Wm. FOSTER,

WHOLESALE TEA DEALER,

PHILPOT LANE, CITY.

RECHERCHE WINES!

FIRST CLASS WINES ONLY.

H. H. HAMMICK,

IMPORTER AND WHOLESALE DEALER,

11, PALL MALL, LONDON (Opposite the Traveller's Club

)WARDS' PATENT PRESERVED POTATO

TO KEEP IN ALL CLIMATES.

aval, Military, and Medical Reports made to Her Majesty's Government from all parts e world, in addition to the Professors' Certificates, testify that this PATENT PRESERVED ATO *contains all the virtue and Anti-scorbutic properties of the fresh Potato.*

DWARDS' PRESERVED POTATO is adopted on the various Scales of Victualling by the Hon. the Lords of the Admiralty, Her Majesty's Commissioners for Emigration, the Hon. East India any, Hudson's Bay Company, the Army Service, and for Shipping in general.

RCTIC REGIONS.—Extracts of Reports from the Commanders and Medical Officers of the Arctic ditions, under Captain Sir James Ross, 1848 and 1849, and Captain Austin, 1850 and 1851:—

Edwards' Preserved Potato is invaluable as a sea-store: sickness and scurvy having occurred, this red vegetable proved of the most essential benefit. . . . . We are induced to entertain a high opinion anti-scorbutic properties. The whole of the people appeared to relish the Preserved Potato more their salt meat than anything else, and infinitely to prefer it to rice."

dmiral Sir John Ross testifies as to its anti-scorbutic properties, fully established in the different ships, ecommends that it should be liberally supplied to every ship.

APE OF GOOD HOPE.—Dr. Hall, Inspector-General, King William's Town, reports:—"I am of on the virtues of the recent potato are well preserved in the Patent Preparation, and of the greatest rtance as an article of diet, both for sick and well."

REVENTION AND CURE OF SCURVY.—Sir William Burnett, Director-General of the Medical Department of the Navy, recommends—"In addition to lemon-juice, the use of the Preserved Potato, at the rate uarter of a pound per man, twice a week, as a prophylactic."

HE LANCET: ANALYTICAL SANITARY COMMISSION.—Examination of Edwards' Patent Preserved o: "From this we obtained an excellent dish of mashed potatoes. . . . . The potatoes prepared under atent of Mr. Edwards were in a perfectly satisfactory state."

his Preserved Potato is cooked IN A FEW MINUTES, by adding boiling water, which ickly absorbed, *and makes the vegetable as cheap as the common Potato, costing about lfpenny per ration.*

.B.—Potatoes can ONLY BE EFFECTUALLY PRESERVED according to Edwards' Patent, any other state they do not stand the test of Time and Climate.

D. & H. EDWARDS & CO., SOLE PATENTEES,
1. BISHOPSGATE STREET, AND WAPPING WALL, LONDON.

dwards' Patent Preserved Potato is considerably reduced in price, and supplied by all Pro-n Merchants & Storedealers in London & the Outports of the United Kingdom, Colonies, &c.

SEBASTOPOL.

PRESERVED MEATS.

J. H. GAMBLE AND CO.,

ESERVED FRESH PROVISION MERCHANTS, AND EXPORT OILMEN,
137. LEADENHALL STREET.
OPPOSITE THE EAST INDIA HOUSE, LONDON.

LATEST TESTIMONIAL.

ract from the Despatches of CAPT. ROBERT M'CLURE, H. M. S. Investigator, to the ords Commissioners of the Admiralty, dated Bay of Mercy, Baring's Island, pril 5th, 1853

I can attribute our excellent salutary state to the causes previously alluded to in this rative, in conjunction with the bountiful supply of game which a merciful Providence has d us with, and has so materially added to our otherwise scanty rations, as well as the ellence of all species of our provisions, which are certainly of the best description I have met with, more particularly the superior quality of the lime-juice, which, as an antiscor-ic, has proved most inestimable, with the Preserved Meats supplied by Messrs. GAMBLE, ch for weight, exemption from bone, and excellence, rank in the very highest scale."— ES, Monday, 24th October, 1853.

fficial Reports and Testimonials of the Preserved Provisions have been also received n his late Majesty; from the Commissioners for executing the office of Lord High miral; the Honorable the Commissioners for Victualling Her Majesty Navy; The orable the East India Company; The Governor and Council of St. Helena; Sir eph Banks; Sir Astley Cooper; Admiral Keith; Viscount Torrington; Vice-niral Cochrane; Sir Henry Blackwood; Commodore James Brisbane; Captain l Hall; Sir Gilbert Blane, F.R.S. Physician to King George IV.; Vice-Admiral Sir ard Codrington, &c. &c.

CONDIMENTS

Manufactured from the choicest

INDIAN VEGETABLE SUBSTANCES,

and prepared after ORIGINAL RECEIPTS from persons of Epicurean Celebrity

The stomachic and wholesome properties of the following Comestibles will rea ensure their approval with the connoisseur:—

CURRY POWDER, 1*s.* 6*d.*, 2*s.* 3*d.*, and 3*s.* 6*d.* per Bottle.

CURRY PASTE, 2*s.* 3*d.* and 3*s.* 6*d.* per Bottle.

MULLIGATAWNEY PASTE, 2*s.* 3*d.* and 3*s.* 6*d.* per Bottle.

CURRY, HAMPSHIRE, and MOGUL SAUCE, ORIENTAL RELISH, all 1 per Bottle.

DELHI, OSELLE, TOMATA, BENGAL CLUB, and MANGOE CHUT all 1*s.* 6*d.* per Bottle.

PAYNE AND SON,

FOREIGN WAREHOUSEMEN,

328. REGENT STREET, AND 46. MORTIMER STREET,
LONDON.

SOYER'S BEVERAGES.

SOYER'S NECTAR, **LEMONA AND SODA WATE**

Manufactured at the Depot, 112. High Holborn.

The famous NECTAR is prepared from receipts concocted by M. SOYER, a highly recommended as light cooling drink.

LEMONADE, SODA WATER, and GINGER BEER also of the first qualit

⁂ Export and Country Orders attended to.

See that the cork of each bottle has the name of SOYER stamped upon it.

ROSSE AND BLACKWELL,

PURVEYORS IN ORDINARY TO HER MAJESTY,

CTFULLY invite attention to the following RICH SAUCES and CONDIMENTS, with the various other delicacies they have for many years enjoyed so high a nce for, can be obtained of most respectable Sauce Vendors and Italian Wareıen in the United Kingdom, and at the principal Stores throughout the world.

Royal Table Sauce.

w Sauce, of a peculiarly delicious and piquant flavour, first introduced in 1847 received universal commendation from the best judges, and is in very general use tables of the nobility, and the principal clubs. To those who prefer a rich warm it may be confidently recommended as the best ever yet produced. Sold in , at 1*s.* 6*d.* and 2*s.* 6*d.* each; and in handsome China vases, to be placed on the t 3*s.* each.

Soho Sauce.

flattering reception this Sauce has met with from the most distinguished epicures, ıts the proprietors in recommending it as the best of its kind extant. It is comof a variety of ingredients, which are all so thoroughly amalgamated that, while uancy is extraordinary, no decided flavour can be said to predominate. For fish, steaks, and made dishes, this is a most desirable sauce.

Essence of Anchovies.

produce this well known and justly esteemed Sauce, C. and B. use none but the picked Gorgona Anchovies, of which they annually import large supplies for this s purpose. It is necessary to state this, as the fact is notorious that much of the vended under this name is made from Sardines, and an inferior description of n fish, against which purchasers cannot be too strictly on their guard.

Dinmore's Essence of Shrimps.

s Sauce is used for the same purposes as the Essence of Anchovies, but being erably milder, is preferred by many. It is prepared by C. and B. at their special on the sea-coast, and the true flavour of the shrimp being retained, the Sauce is ed most delicious.

an excellent relish with boiled and fried fish of every description.

Sir Robert Peel's Sauce, FOR GENERAL PURPOSES.

h bottle is labelled with a *fac-simile* of the Right Honourable Baronet's letter roval.

Strasbourg Potted Meats.

This delicious preparation far surpasses every description of Potted Meat yet in duced to public notice; the flavour is full and rich, at the same time being so mild a bland, that the most delicate and fastidious palate is pleased. It is also very easy digestion, and adapted to weak stomachs.

Calves' Feet Jellies.

Consisting of Orange, Lemon, Noyau, Punch, Madeira, and Calf's Foot. These a sold in convenient sized bottles, and their use is attended with a great saving of troubl and inconvenience; besides which, they ensure the certainty of the Jelly always bein of uniform excellence and flavour.

They are now in almost daily consumption in many families, and are very high approved.

Pickles OF ALL DESCRIPTIONS.

The superiority of these is too well known and appreciated to need any remark.

Fruits IN BOTTLES.

Preserved *pure* for Tarts; available when fresh fruits are not in season.

Syrups OF VARIOUS KINDS, FOR FLAVOURING ICES;

Or which, if diluted with iced or spring water, produce a cool and refreshing bevera

C. and B. consider it important to state, that the whole of their manufactures are prep with the most scrupulous attention to cleanliness and purity. The utmost precautio taken in every instance to prevent contact with copper, or any other pernicious me and to ensure this end, they have at a great expense fitted their factory at Soho Sq with a number of Earthenware Steam-pans, and in addition have had a large Silver made, in which to prepare the most delicate of their productions.

M. SOYER'S SAUCES AND CONDIMENTS

The following may be had of M. SOYER'S Wholesale Agents, CROSSE AND BLACKWELL, 21. Soho Square.

Soyer's Aromatic Mustard.

A most exquisite combination of the genuine Mustard seed with various aro substances: infinitely superior to all other preparations of Mustard.

Soyer's New Sauces.

One of a mild description for the ladies, and another of the same flavour, but war for gentlemen.

Soyer's Relish.

With reference to this Sauce, the *Observer* remarks: —

"M. Soyer is a culinary artist as profound as he is versatile; nothing comes ami him. No foreign *cuisinier* ever tickled the Saxon palate so successfully. He is a man; and the ill-cooked mutton chops, that lost Napoleon the battle of Leipsic, w have produced a very different effect if Soyer had dished them up in his Magic S and rendered them thoroughly light and digestible by his appetizing Relish."

WHOLESALE WAREHOUSE,

21. SOHO SQUARE, LONDON.

EEMANS' STRONGEST PURE ESSENCE OF ANCHOVIES, 2*s.* PER BOTTLE.

BEST RED COLOURED, THICK, DITTO, 1*s.* PER BOTTLE.

FREEMAN AND CO.,

4. WIGMORE STREET, CAVENDISH SQUARE.

PURVEYORS

TO THE QUEEN PRIZE MEDAL AWD^{D}.

ESTABLISHED 1695.

nmerous complaints of the mixtures hitherto sold under the name of Essence chovies, have induced the Proprietors to give their attention to the manufacture ure and unadulterated Fish Sauce; which they alone prepare, by a peculiar patent s, from the real soluble Gorgona fish; without any colouring or injurious com- so universally used in other Fish Sauces.

following caution against POISONOUS FISH SAUCE is quoted from the s in the *LANCET* of the

NALYTICAL SANITARY COMMISSION.

cet, No. XX. *v.* 13*th*, 1852. *Page* 449. "It is not generally known, that the red colour of Anchovy Sauce is caused by an admixture of VENETIAN RED, which, taken in quantities, might occasion serious obstructions to the bowels." . . . . "It is also to be feared that the less scrupulous manufacturers mix RED LEAD to enhance its colour,—purposely *Page* 450. adding this POISONOUS colouring matter." . . . . "Anchovy Sauce is ADULTERATED in OTHER ways,—some of them cannot be detected, others can." *Page* 451. . . . . "Flour is also employed with CHALK, PLASTER OF PARIS, &c." . . . . "Artificial colouring matters are employed to conceal the dirt contained in the brine in which the fish is imported." . . . . "That the practice of adding coloured earthy substances to articles of diet is dirty, injurious to health, and even dangerous to life, cannot be doubted." . . . . "The chief medicinal ingredient in BOLE ARMENIAN is OXIDE OF IRON." . . . . . .

No. XXIII. *Dec.* 4*th*, 1852. *Page* 528. "Instances have occurred of the pigment having been adulterated with ORANGE RED, which is nothing else than a better kind of minium or RED OXIDE OF LEAD."

"Accum observes, under the head of poisonous Anchovy Sauce—'Several samples which we have examined of this Fish Sauce, have been found contaminated with Lead.'"

e ANALYTICAL SANITARY COMMISSION, in their results of Micro- cal and Chemical analysis of numerous Sauces purchased at the principal shops ndon, thus give their opinion of

FREEMANS'

FISH PATENT SAUCE

ESSENCE OF ANCHOVIES,

ich was the 33rd sample of the Sauces examined.

Lancet. *Page* 530. "This Sauce is of pale-brown colour, liquid, and transparent, without a particle of sediment, and is flavoured with the Juice or Essence of the Anchovy: **it is free from all adulteration, and is certainly a much more pleasant and wholesome Sauce** than the highly coloured and adulterated compound ordinarily sold under the misnomer, 'Essence of Anchovies.'"—They also state that—

Page 530. "The WHOLE of the other Samples of Essence of Anchovies analysed WERE ADULTERATED with IMMENSE QUANTITIES of the ferruginous oxide—BOLE ARMENIAN, and that traces of Copper were discovered in some three or four samples."

e or two spoonsful of FREEMANS' PURE ESSENCE OF ANCHOVIES, mixed boat of melted butter, makes the best Sauce for all Fish. A rich zest may be by a small portion of FREEMANS' DIGESTIVE SAUCE (from the recipe of inent Physician), esteemed as the most delicious generally useful of all Sauces; a of this fine stomachic used daily, at dinner, is considered to be conducive to health.

TO THE QUEEN **FREEMANS'** PRIZE MEDAL AWARD^{D}.

FREEMAN AND CO., 4. WIGMORE STREET, CAVENDISH SQUARE, LONDON.

CAUTION.

MESSRS. ALLSOPP & SONS

find it necessary to caution the Public, and especially Shippers o
Ales to the Colonies, against Frauds committed by Parties in
spurious Ales for those of Messrs. ALLSOPP and SONS.

MESSRS. ALLSOPP AND SONS

have felt compelled, by the extent to which this disgraceful practi
been carried, to proceed in several cases by obtaining injunctions fr
Court of Chancery, and have ultimately been driven to prosecute
nally for the commission of this offence. They beg to call attention
case of

THE QUEEN v. GRAY and GOSLIN,

in which LORD CAMPBELL sentenced the parties charged to "
Months' Imprisonment, with Hard Labour." — Vide "Times
"Morning Advertiser" of the 18th May.

MESSRS. ALLSOPP AND SONS

will thank all persons having reason to doubt the genuineness
article sold under their name, to send them the earliest informa
order that immediate steps may be taken for prosecuting the partie

MESSRS. ALLSOPP AND SONS

will be happy to furnish the Names of respectable Houses, where a
of their Ales may be depended on, as genuine from the Brewery.

Brewery, Burton-on-Trent.

Branch Establishments: —

LONDON, at 61. KING WILLIAM STREET, CITY.
LIVERPOOL, at COOK STREET.
MANCHESTER, at DUCIE PLACE.
DUDLEY, at the BURNT TREE.
GLASGOW, at 115. ST. VINCENT STREET.
DUBLIN, at 1. CRAMPTON QUAY.
BIRMINGHAM, at MARKET HALL.
SOUTH WALES, at 13. KING STREET, BRISTOL.

EXETER HALL VAULTS,

STRAND.

ASS AND ALLSOPP'S PALE ALES,

AND

GUINNESS' DUBLIN STOUT.

he above Beverages, which have been so continually recommended, and have proved so ently beneficial to those who suffer from weak digestion, *Purity*, of course, is the t point to insure.

he ANALYTICAL SANITARY COMMISSION of the "LANCET" has provided for the lic a safeguard in this most important particular, bringing to light the various ad-tures in all articles of food and beverages in common consumption, and have de-nced all those where adulteration has been discovered, and also given publicity to e houses where a genuine article is to be procured. We therefore beg to refer the lic to the annexed Report, and, upon application, will be glad to furnish a list of e Wine Merchants, Taverns and Hotels, which are supplied from the above Stores asks and Bottles.

DAUKES AND RODICK.

eport of the Analytical Sanitary Commission of the "Lancet," 15th May, 1854.

"ANALYSIS"

FROM THE STORES OF

DAUKES AND RODICK,

3. EXETER STREET, STRAND.

"The product of Malt and Hops, and the constituents of pure spring water; not any other kind of ingredients found, either organic or inorganic."

ALLSOPP'S PALE ALE,

IN CASK AND BOTTLE,

AS RECOMMENDED BY THE MOST ABLE PHYSICIANS AND SURGEONS,

AS WELL AS THE

EMINENT CHEMISTS OF THE DAY.

"An agreeable and efficient tonic; a general beverage both for the invalid and the robust."—BARON LIEBIG.

"Preserves the tone and vigour of the stomach, and conduces to the restoration of the health."—LANCET COMMISSIONERS.

"I recommend bitter ale medicinally."—SIR CHARLES CLARKE, M.D., Physician to the late Queen Dowager.

"Great value in a dietetic and remedial point of view."—Dr. MARSHALL HALL.

"Confidence in its wholesomeness as a beverage."—BENJAMIN TRAVERS, F.R.S.

"Gives strength to the stomach, and allays its morbid irritability."—Dr. ROWE.

"Exceedingly valuable tonic; a most useful medicine in a most acceptable form."—BANFIELD VIVIAN, Esq., Surgeon, &c.

"For invalids and delicate stomachs."—Dr. JAMES HEYGATE, F.R.S.

"The best malt beverage that can be taken either in health or disease."—Dr. NORTH ARNOLD.

"Used in my own family for many years; even more wholesome than home-brewed ale."—Dr. GEORGE FABIAN EVANS.

"Order my patients Allsopp's Bitter Beer with marked advantage."—Dr. RICHARD FORMBY.

"Of a nutritive and stomachic character—can safely depend upon Allsopp's Bitter Beer."—Dr. JAMES PETRIE.

"An excellent and safe stomachic—often supersedes strengthening medicine."—Dr. JAMES R. W. VOSE.

"Prescribe as the drink for dinner use."—JOLLIFFE RUSSELL, F.R.S.

"Recommend Allsopp's Ale strongly to all my patients; to me it is much more agreeable than that of other brewers."—CHRISTOPHER T. A. HUNTER, Esq., Surgeon, &c.

"Does not occasion that acidity of stomach which less perfectly fermented ales do."—THOMAS DAVIES, F.R.S.

"Good effects to young children and persons suffering from excessive debility."—Dr. RICHARD P. JONES.

"The great value these celebrated Ales exercise in many dyspeptic complaints—perfect medicine."—RAWSON SENIOR, Esq., Surgeon, &c.

"A useful and wholesome beverage."—WM. MACLAREN, Esq., Surgeon, &c.

"Entire purity; superlative wholesomeness of Allsopp's Pale and Bitter Ales. The best form of malt liquor ever supplied to the public."—THOMAS MACAULAY, Esq., Surgeon to the Leicester Infirmary.

"A mild, bitter, and pleasant beverage, for giving increased impetus and vigour to weak and low stomach."—Dr. WILLIAM GUY.

"Equally calculated to regain health and preserve it."—JAMES TEEVAN, M.R.C.S.

"A wholesome beverage and a tonic."—EDWARD C. HILL, Esq., Surgeon.

"Of much service where other beverages in many cases were inadmissible."—J HARRISON, Esq., Surgeon.

"Well adapted to those in health—calculated to strengthen and invigorate the system in hot climates."—J. H. PEPPER, F.C.S., A.C.E., &c.

"Recommend it in preference to every other beverage of a similar kind."—Dr. Tho NEWMAN.

HARRINGTON PARKER, & Co.,

BEER MERCHANTS,

5½ PALL MALL.

NS TOWN BREWERY, CHELSEA.

A. E. DRUCE AND SONS,

call the attention of the Nobility, Gentry, and their friends in , to the report of

NALYTICAL SANITARY COMMISSION in the "LANCET," No. 13. Vol. II., Sept. 30.,

ich it is proved that their Stout is the strongest and purest in . They therefore confidently recommend it to the notice of the , in cases where Malt Liquor is considered desirable for invalids.

MESSRS. A. E. DRUCE AND SON

ALSO

W ALL KINDS OF ALES AND PORTER,

ake it their peculiar study to select the finest Malt and Hops only purpose.

ble Brown Stout	**16s.**	**0d.**	**9 Gallons.**
le do.	**13s.**	**0d.**	"
. Ale	**20s.**	**0d.**	"
"	**16s.**	**0d.**	"
"	**11s.**	**0d.**	"
"	**10s.**	**0d.**	"
ter	**10s.**	**0d.**	"
le Ale	**8s.**	**6d.**	"
India XX. Ale	**16s.**	**0d.**	"
Do. X. "	**10s.**	**0d.**	"
. Light Bitter Ale	**8s.**	**6d.**	"

PALE ALE,

EDINBURGH ALE, DUBLIN STOUT.

ROBERT MILLER,

6, CROSS STREET, FINSBURY SQUARE,

Agent to Messrs. BASS, RATCLIFF, & GRETTON, Brewers, Burton; Mes ARCHIBALD CAMPBELL, & Co., Brewers to her Majesty, Edinburgh; Messrs. GUINNESS, SON, & Co., Brewers, Dublin.

The Pale Ale, Edinburgh Ale, and Stout of the above firms, supplied in conditio present use, in Casks and Bottles, to all parts of London and the neighbourhood fr expense.

Every attention paid to Country Orders.

A large stock of Ales, Stout, Cyder, &c., always on hand, adapted for exportati all parts of the World.

NATHANIEL EASTTY,

Agent for the Sale of Allsopp's Pale Ales, and Calvert and Co.'s Stouts, and Porte Irish Stouts, for Home Consumption and Exportation.

WINE AND BEER STORES,

132. UPPER THAMES STREET, LONDO

The WINES are warranted pure as imported, and free from acidity.

The BEERS are warranted the products of Malt and Hops, and the constitue pure water, and not any other ingredient, organic or inorganic, as per analysis o fessor Thomas Graham, F.R.S., University College, London, and A. W. Hofman, F.R.S., Professor of the Royal College of Chemistry, published in the "Medical T of Saturday, May 8th, 1852, No. 97, and of the Analytical Sanitary Commissio lished in the "Lancet," Saturday, May 15th, 1852, No. 20, Vol. 1st, upon A AND SONS' EAST INDIA BITTER PALE ALE in Bottle, selected from the St **NATHANIEL EASTTY, 132. Upper Thames Street, London.**

PRICES.

	Legal Excise Quarts.		Legal Excise Pints.		18 Gallon Cask.			Imperi	
								Quarts.	
	s.	d.	s.	d.	£	s.	d.	s.	d.
ALLSOPP'S EAST INDIA PALE ALE -	7	0	4	0	1	13	0	8	0
CALVERT & CO.'S DOUBLE STOUT -	7	0	4	0	1	13	6	8	0
Ditto Stout - - -	5	6	3	0	1	7	6		
Ditto Porter - -	4	6	2	9	1	0	0		
Burton Ale - - - - -	8	6	4	6	2	0	0	10	6
„ Ditto Extra Quality - -	9	6	5	6	2	10	0	11	6
Edinburgh Ale - - - -	8	6	5	0	1	15	0	11	0
Devonshire Cyder - - - -	7	6	4	6	1	10	0		

PORTS and SHERRIES 30*s.* to 60*s.* per dozen.

HILL, EVANS, & CO.,

BRITISH WINE AND MALT VINEGAR MAKERS,

WORCESTER;

AND

15. WHITECROSS STREET, CRIPPLEGATE,

LONDON.

The Manufacture of HILL, EVANS, & Co.'s Vinegar is described in pages 373. and 374. of this Work, and the purity of the article stated in pages 490. 492, 493, and 494.

HILL, EVANS, & CO.,

British Wine and Malt Vinegar Makers.

PURE VINEGAR.

Guaranteed to be free from all Impurities, and to kee
for any length of time.

THE importance to buyers of Vinegar of being able to ensure purity and streng
without the addition of Sulphuric or other Foreign Acids, was exhibited in the resu
of the Analyses of 33 samples by the ANALYTICAL SANITARY COMMISSIO
of the "LANCET," which showed that 12 samples out of the 33 analysed contained
Sulphuric Acid, that 8 samples contained the quantity formerly permitted by t
Excise, and that in the remaining cases, the amount exceeded this, and in some insta
was 3 or 4 times as great. The absence of impurities of this or any other nature c
be ensured, by inquiring for the Concentrated Vinegar, of which several samples h
been analysed by Chemists of Eminence, and from whose reports the subjoined extr
are made:—

From ARTHUR H. HASSALL, M.D., Chief Analyst of the Analytical Sanitary C
mission of the "Lancet," &c. &c. &c.

"The above Analysis shows that *A* is fully six times as strong as No. 22. Vinega
and that *B* is fully six times the strength of No. 18. Vinegar * * *.

"Further, the Vinegars were pure and unadulterated, not containing a particle of
Sulphuric Acid, or any other adulterating ingredient whatsoever.

"They were bright and clear, refreshing to the taste and smell, and in every resp
well manufactured and wholesome Vinegars * * *."

(Signed) ARTHUR H. HASSALL, M.D.
8. Bennett Street, St. James,
17. October, 1854.

From HENRY LETHEBY, M.B., Professor of Chemistry and Toxicology in the Med
College of the London Hospital, and Chemical Referee to the Corporation of Londo

"Two samples of a patent Concentrated Malt Vinegar have been placed in my ha
for analysis. The samples were marked *A* and *B*, and were intended to be dil
with five times their bulk of water, in order to produce, in one case, the Vinegar kno
in Commerce as No. 22., and the other that of No. 18. * * *

"They both have the aroma of good Malt Vinegar, and their colour is nearly as d
as Port Wine. * * *

"Both of the samples are perfectly free from uncombined Sulphuric Acid. * *
The proportion of extract of Malt furnished by the two samples amounted in one cas
19·5 per cent., and in the other to 19.

"The result of this inquiry therefore is, that the two samples of Vinegar submitte
my examination are both specimens of pure Malt Vinegar. * * *

"Lastly, I ought to state, that the Vinegars thus produced, and called Nos. 22. and
are equal in point of strength, aroma, and flavour, to the best Malt Vinegars of Eng
Commerce."

(Signed) HENRY LETHEBY, M.B.
Laboratory, London Hospital,
3. October, 1854.

From ANDREW URE, M.D., F.R.S., Professor of Chemistry.

"These Vinegars possess an excellent flavour, equal to those of the best makers, and ontain no free Sulphuric or other Mineral Acid."

(Signed) ANDREW URE, M.D., F.R.S.

The Concentrated Vinegar is sold of two strengths, one marked *A*, to make six times its ulk of the strongest Vinegar usually sold. The other marked *B*, to make six times its ulk of ordinary Vinegar.

To be obtained retail of Chemists, Oilmen, Grocers, and others,

A, at 2s. 6d. per Quart Bottle,

B, at 2s. per Quart Bottle.

And wholesale, of the Agents

CONDY, BROTHERS & CO.,

15. GARLICK HILL, THAMES STREET.

VINEGAR AND ITS ADULTERATIONS.

ome time ago the spirited proprietors of "The Lancet" appointed a body of Ana- ytical Sanitary Commissioners to analyze the solids and fluids consumed by all classes f society. The results of these inquiries have been published from time to time, and ave astounded the people of this country by the fact that, with few exceptions, every rticle of food is more or less adulterated with deleterious substances. The Commis- ioners have just published a Report of their Analysis of

TWENTY-EIGHT SAMPLES OF VINEGAR,

purchased from different Retailers of the article, who received it from the London manufacturers, **four only of which were free from Poison.**

The first on the list was manufactured by

HILLS AND UNDERWOOD,

OF NORWICH, AND

25. EASTCHEAP, LONDON.

The Report goes on to prove that the Adulterations, which are of a most injurious haracter, are effected by the Vinegar Makers themselves, and not by the Retailers. ulphuric and other Acids are freely used, and the public health must inevitably suffer. uch conduct on the part of manufacturers cannot be too severely censured; and the ublic should take care to support only such firms as those of

HILLS AND UNDERWOOD,

ho have manufactured a PURE AND FIRST-RATE ARTICLE in competition with those ho use Sulphuric Acid or Vitriol.

The Analyses of "The Lancet" Commissioners furnish a singular confirmation of he decision of the judges in this particular department of the GREAT EXHIBITION, he firm of **Hills and Underwood** having had the honour of carrying off the PRIZE or the BEST VINEGAR on that occasion.

HILLS AND UNDERWOOD'S VINEGAR is supplied by the ost respectable Spirit Dealers, Grocers, and Oilmen in town and country.

THE LARGEST WATERPROOF ESTABLISHMENT IN THE WORLD.

EDMISTON, 69. AND 416. STRAND,

AND No. 3, SOUTH-WEST GALLERY, CRYSTAL PALACE.

THE POCKET SIPHONIA,

OR, WATERPROOF OVERCOAT, WEIGHT 10oz.

SOLE MANUFACTURERS of the celebrated POCKET SIPHONIA, remarkable for its lightness and softness of texture, adapted for Sportsmen, Travellers, and Tourists, easily folded to carry in the Pocket or on Saddle, obviating the stickiness and unpleasant smell peculiar to all other Waterproofs.

Price according to size, 40*s.* to 50*s.*; all silk throughout 50*s.* to 60*s.* Measurement, length of coat and size round the chest over the coat. Stout Siphonias, 25*s.* to 30*s.* Reversible Alpacas, 25*s.* to 35*s.* Overalls, 8*s.* 6*d.* to 10*s.* 6*d.* Ladies' Capes and Hoods, Petticoats, &c.

WATER BEDS ON HIRE. Water pillows of all sizes and shapes. FISHING and WADING BOOTS, requiring no dressing. FISHING STOCKINGS 25*s.* per pair. Life Buoys, and Waist Belts, Air Seats for Fishing, and Folding Sponge Baths.

NOTICE.—Name and Address Stamped Inside. None other are Genuine.

EDMISTON AND SON,

WATERPROOFERS, 69. AND 416. STRAND.

THE 16s. TROWSERS REDUCED TO 14s

Trousers and Waistcoat - - -	22*s.*
Coat, Waistcoat, and Trousers - -	47*s.*

Made to order from Scotch Tweeds, all Wool,

BY

B. BENJAMIN,

MERCHANT TAILOR, 74. REGENT STREET

A PERFECT FIT GUARANTEED.

RUPTURE.

COLES'S TRUSS
IS BEST.

THIS IS THE INVENTION PATRONISED BY
SIR ASTLEY COOPER
AND THE MOST EMINENT SURGEONS, WORN AND RECOMMENDED BY
WILLIAM COBBETT,

And which has commanded for 30 years a constantly increasing reputation; it is what a truss should be, perfectly efficacious, yet agreeable to the wearer.

Read "Cobbett's Legacy to Ruptured Persons," gratis.

3. CHARING-CROSS.

Mr. HOWARD,
SURGEON-DENTIST,
52. FLEET STREET,

HAS INTRODUCED AN ENTIRELY NEW DESCRIPTION OF

ARTIFICIAL TEETH,

Fixed without springs, wires, or ligatures. They so perfectly resemble the natural teeth, as not to be distinguished from the originals by the closest observer; they will never change colour or decay, and will be found superior to any teeth ever before used. This method does not require the extraction of roots, or any painful operation, and will support and preserve teeth that are loose, and is guaranteed to restore articulation and mastication. Decayed teeth rendered sound and useful in mastication.

52. FLEET STREET.—At home from Ten till Five.

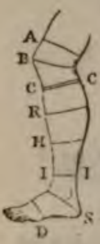
THE

COMFORT OF A FIXED WATER-CLOSET FOR £1.

Places in gardens converted into comfortable water-closets by the PATENT HERMETICALLY SEALED PAN, with its self-acting valve, entirely preventing the return of cold air or effluvia. Any carpenter can fix it in two hours. Price 1*l.* Hermetically sealed Inodorous Chamber Commodes, 1*l.* 4*s.*, 2*l.* 6*s.*, and 3*l.*; also Improved Portable Water-closets, with pump, cistern, and self-acting valve. A prospectus, with engravings, forwarded by inclosing two post stamps.

AT FYFE AND CO'S SANATORIUM,
46. LEICESTER SQUARE, LONDON.

FOR VARICOSE VEINS AND WEAKN



Surgical Elastic Stockings and Knee-caps, on
Principle, pervious, light in texture, and inexpensive, yielding a
efficient, and unvarying support under any temperature, without
of Lacing or Bandaging; LIKEWISE A STRONG LOW-PRICED AR
HOSPITALS AND THE WORKING CLASSES: ELASTIC NET CO
the same beautiful fabric. ABDOMINAL SUPPORTING B
both sexes: those for ladies' use before and after accouchem
mirably adapted for giving adequate support with extreme lig
point little attended to in the comparatively clumsy contrivances
hitherto employed. Instructions for measurement, in prices, on a
and the articles sent by post, from the Manufacturers,

POPE & PLANTE, 42, WATERLOO PLACE, PALL

The Profession, Trade, and Hospitals supplied.

BANDAGES AND TRUSSES.

WEAK LEGS, KNEES, AND ANKL

Look to your Legs!

If they swell, or the veins are enlarged, get one of **Bailey's Elastic Stoc**
Knee Caps, to draw on without the trouble of lacing. The prices com
7*s.* 6*d.*; **Stocking Knee-cap, 6s. 6d.** The following articles kept rea
Trusses, Crutches, Belts, Suspensory Bandages, &c. &c.

An illustrated Catalogue may be had of every kind of artificial leg and
bandage made at this old Establishment.

Copy the Address:—

WILLIAM HUNTLEY BAILEY,
418, OXFORD STREET, LONDON.

EGANT PERSONAL REQUISITES.

Under the **Patronage of**
Courts of Europe, **the Aristocracy,**
and the Upper Classes.

OWLANDS' MACASSAR OIL.

FOR THE GROWTH, RESTORATION, AND FOR

IMPROVING AND BEAUTIFYING THE HUMAN HAIR.

ents Hair from falling off or turning grey, strengthens weak HAIR, cleanses it curf and Dandriff, and makes it BEAUTIFULLY SOFT, CURLY and GLOSSY.

IN THE GROWTH OF

THE BEARD, WHISKERS, AND MUSTACHIOS.

failing in its stimulative operation. For CHILDREN it is especially recommended as forming the basis of A BEAUTIFUL HEAD OF HAIR.

s. 6*d.*; 7*s.*; Family Bottles equal to four small, 10*s.* 6*d.*; and double that size, 21*s.*

TION !—On the Wrapper of each Bottle are the words, Rowlands' Macassar two lines. The same are engraven on the back of the wrapper nearly 1,500 containing 29,028 letters.

ROWLANDS' KALYDOR,

An Oriental Botanical Preparation

FOR

ROVING & BEAUTIFYING THE COMPLEXION,

Eradicates Cutaneous Defects and Discolorations, and renders

THE SKIN SOFT, FAIR, AND BLOOMING.

ates all the effects of Climate on the Skin, whether with reference to cold and ency, or intense solar heat, and affords immediate relief in cases of sunburn, stings cts, or incidental inflammation. Gentlemen after shaving will appreciate its ng and ameliorating properties.

Price 4*s.* 6*d.* and 8*s.* 6*d.* per bottle.

TION.—The words Rowlands' Kalydor are on the wrapper of each bottle, ir Signature A. Rowland & Sons, 20. Hatton Garden, London, in red ink, at foot.

ROWLANDS' ODONTO,

OR PEARL DENTIFRICE.

unded of the choicest and most recherché ingredients of the ORIENTAL HERBAL, and of inestimable value in

PRESERVING AND BEAUTIFYING THE TEETH,

STRENGTHENING THE GUMS,

AND IN RENDERING

HE BREATH SWEET AND PURE.

Price 2*s.* 9*d.* per box.

ION.—The words Rowlands' Odonto are on the label, and A. Rowland s, 20. Hatton Garden, engraved on the Government Stamp affixed on each box.

ld by A. ROWLAND & SONS, 20. Hatton Garden, London.

AND BY CHEMISTS AND PERFUMERS.

⁂ *BEWARE* OF SPURIOUS IMITATIONS. —

TO THE BINDER.

Place Highley's Catalogue opposite to page 2. of the Advertisements.

PICKLES AND THEIR ADULTERATIONS.

To the Editor of the "Lancet."

SIR,

My attention has been drawn to an article in your valuable Journal, under the head of "Pickles and their adulterations," in which my name with others in the trade are mentioned.*

The public owe you a deep debt of gratitude for your unwearied labour in detecting and exposing the adulterations practised in the various articles of food: in so doing you are not rendering a greater service to society at large, than to the manufacturer and tradesmen of integrity and honesty.

I observe with much gratification, that of the twenty samples of pickles recently analyzed by you, mine are the most favourably distinguished in your report as "contaminated with a very small quantity of copper, as shown by a very slight deposition of metal on the bar of iron."

My object, Sir, in troubling you is, first, to inquire whether my Pickles were at all inferior in quality to the other samples, since, if that is not the case, it confirms my conviction that the use of copper you allude to is not necessary to produce the fine green colour; and secondly, I beg leave to state, that I never employ copper or any other agent besides that of fire and vinegar in the process of "Greening Pickles." I am utterly at a loss to account for the presence even of the very small quantity of copper which you have discovered, unless it has arisen from the vessel used in heating the vinegar, which is always kept clean and perfectly bright, and if so, the slight contamination of copper would be the result of accident, and not of adulteration. I shall esteem it a great favour if you will give me your opinion on these points, having always understood that hot vinegar would not act upon copper.

With apologies for intruding upon your valuable time,

I am, Sir, your obedient servant,

W. G. NIXEY.

Moor Street, Soho, Feb. 7. 1852.

⁂ Vinegar, whether hot or cold, and especially when hot, acts energetically on copper, however clean and bright it may be kept; and in proportion to the length of time during which the metal is allowed to remain in contact with the vinegar, so will the extent of impregnation be greater. The use of the copper vessel, as described by Mr. Nixey, conclusively accounts for the presence of the small quantity of copper detected in the pickles purchased at his establishment. In other respects the pickles seem of good quality.—*Analytical Commissioner.*

---

* Food and its Adulterations, p. 386.

ELEGANT PERSONAL REQUISIT

Under the The Courts of Europe, Patronage of the Aristocracy and the Upper Classes.

ROWLANDS' MACASSAR OI

FOR THE GROWTH, RESTORATION, AND FOR

IMPROVING AND BEAUTIFYING THE HUMAN HAIR.

It prevents Hair from falling off or turning grey, strengthens weak HAIR, cle from Scurf and Dandriff, and makes it BEAUTIFULLY SOFT, CURLY and GL

IN THE GROWTH OF

THE BEARD, WHISKERS, AND MUSTACHIOS.

It is unfailing in its stimulative operation. For CHILDREN it is especially mended as forming the basis of A BEAUTIFUL HEAD OF HAIR.

Price 3*s.* 6*d.*; 7*s.*; Family Bottles equal to four small, 10*s.* 6*d.*; and double that si

CAUTION !—On the Wrapper of each Bottle are the words, ROWLANDS' MAC OIL, in two lines. The same are engraven on the back of the wrapper nearl times, containing 29,028 letters.

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THE SKIN SOFT, FAIR, AND BLOOMING.

It obviates all the effects of Climate on the Skin, whether with reference to c inclemency, or intense solar heat, and affords immediate relief in cases of sunburn, of insects, or incidental inflammation. Gentlemen after shaving will appreci softening and ameliorating properties.

Price 4*s.* 6*d.* and 8*s.* 6*d.* per bottle.

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Compounded of the choicest and most recherché ingredients of the ORIENTAL BAL, and of inestimable value in

PRESERVING AND BEAUTIFYING THE TEETH,

STRENGTHENING THE GUMS,

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THE BREATH SWEET AND PURE

Price 2*s.* 9*d.* per box.

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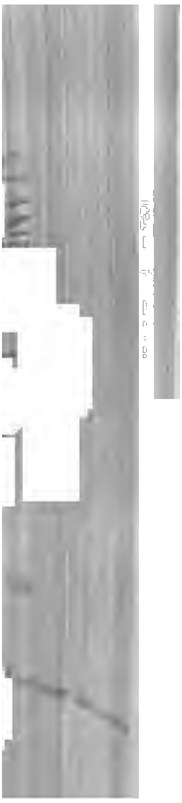
☞ Sold by A. ROWLAND & SONS, 20. Hatton Garden, Lo

AND BY CHEMISTS AND PERFUMERS.

∴ BEWARE OF SPURIOUS IMITATIONS.

The Drawings from which the Engravings were prepared were made by Mr. Henry Miller, and the Engravings themselves were executed by Mr. R. Hart, 15. Gloucester Street, Red Lion Square, to both of whom great credit is due for the care and skill bestowed.

We believe that microscopic subjects have never before been portrayed on wood with the same elaboration, minuteness, and fidelity.



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OF
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PUBLISHED BY
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39, PATERNOSTER ROW, LONDON.

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